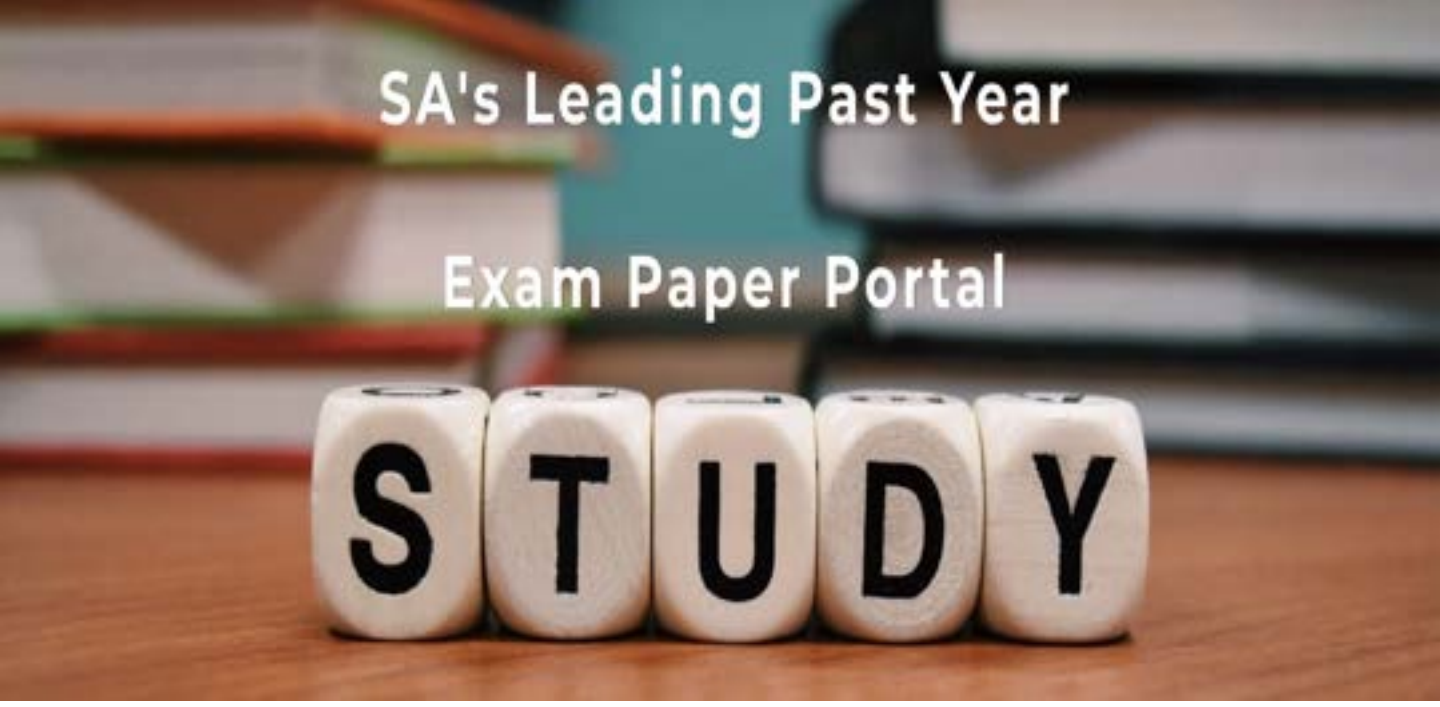

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Via Afrika Geography

Grade 12 Study Guide

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Via Afrika

Our Teachers. Our Future.

Study Guide

Geography

Grade 12

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Contents

Introduction to our Geography 12 Study Guide eBook

Welcome to the Grade 12 Geography Study Guide. The subject of Geography has changed considerably over time and it continues to change because it is one of the most dynamic subjects in the curriculum. The Earth and its biosphere, the home of humankind, is changing all the time and that is what makes our subject so special.

This guide must be used in conjunction with the main textbook, as it is a summary of the main components of the textbook. Geography, like any other subject, does contain facts which must be understood and learnt, but it also emphases skills. It is necessary for the learner to analyse and use these facts to understand phenomena and to try to solve problems. Our lives depend on the ways in which we treat our environment. Thus, as citizens of the Earth, we must understand the changes that are constantly taking place and our own impact on our surroundings.

Geography is all around us at all times. Get into the habit of looking at a city, town, village, landscape and trying to work out the processes that act on it. Why is that shop there, why are there so many people there, why is that hill shaped liked that, how is that river being used? These are the sort of questions that you must get into the habit of asking yourself and trying to answer. Do this regularly and you will be a much better Geographer.

Once you have studied the detail in the main textbook, use this guide as a summary. Concentrate on the key concepts and build your knowledge around them. Do this regularly and you will develop into a genuine geographer ready to take your place as a keeper of our vital environment.

Geographical skills and techniques

Unit 1 Mapwork techniques

1 Applying map skills and techniques

1.1 What is scale?

A map represents a given area on the Earth's surface. Maps are produced at various scales. This relationship between the map and the ground is shown in different ways.

Word scale – The map distance and the ground distance it represents are written in words such as 1 cm represents 500 m.

Representative fraction or ratio scale – The unit of the map distance is the numerator and the equivalent ground distance is the denominator. A representative fraction of 1:50 000 means that one unit on the map such as a centimetre represents 50 000 of the same units on the ground.

Line scale – The ratio between the map distance and the equivalent ground distance is shown on a scale bar (Figure 1).

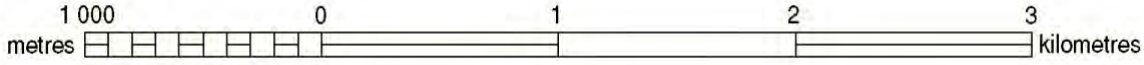


Figure 1 The line scale on a 1:50 000 map

1.1.1 Large and small scale maps

Large scale maps show a lot of detail over a small area and small scale maps show little detail over a large area. A 1:10 000 orthophoto map has a larger scale than a 1:50 000 topographic map. A map of the world at a scale of 1:10 000 000 is a very small scale map.

1.2 How do you calculate distance and area?

<table>
<tr><th colspan="3">Calculating distance, area and converting to hectares</th></tr>
<tr><td colspan="2">Calculating distance
Remember to distinguish between measuring straight line and curved-line distances.
1:50 000 (topographic maps)
1 cm represents 50 000 cm
1 cm represents 500 m
1 cm represents 0,5 km
or 1 mm represents 50 m

1:10 000 (orthophoto maps)
1 cm represents 10 000 cm
1 cm represents 100 m
1 cm represents 0,1 km
or 1 mm represents 10 m</td><td>Estimating area of a rectangle
When calculating a regular area apply the formula: length × breadth.
Use ground distances when calculating area.
First convert the map distances to ground distances before doing the calculation.</td></tr>
<tr><td colspan="3">You must be able to convert both your km² or m² area to hectares (ha).</td></tr>
<tr><td>One hectare (1 ha) = 100 m × 100 m
= 10 000 m²
1 km² = 10 ha × 10 ha = 100 ha</td><td>To convert km² to hectares:
multiply your answer by 100</td><td>To convert m² to hectares:
divide your answer by 10 000</td></tr>
</table>

1.3 What is the relationship between contours and cross-sections?

- A contour is a line joining places of the same height above sea level.
- The vertical distance between two consecutive contours is always the same. It is the contour interval.

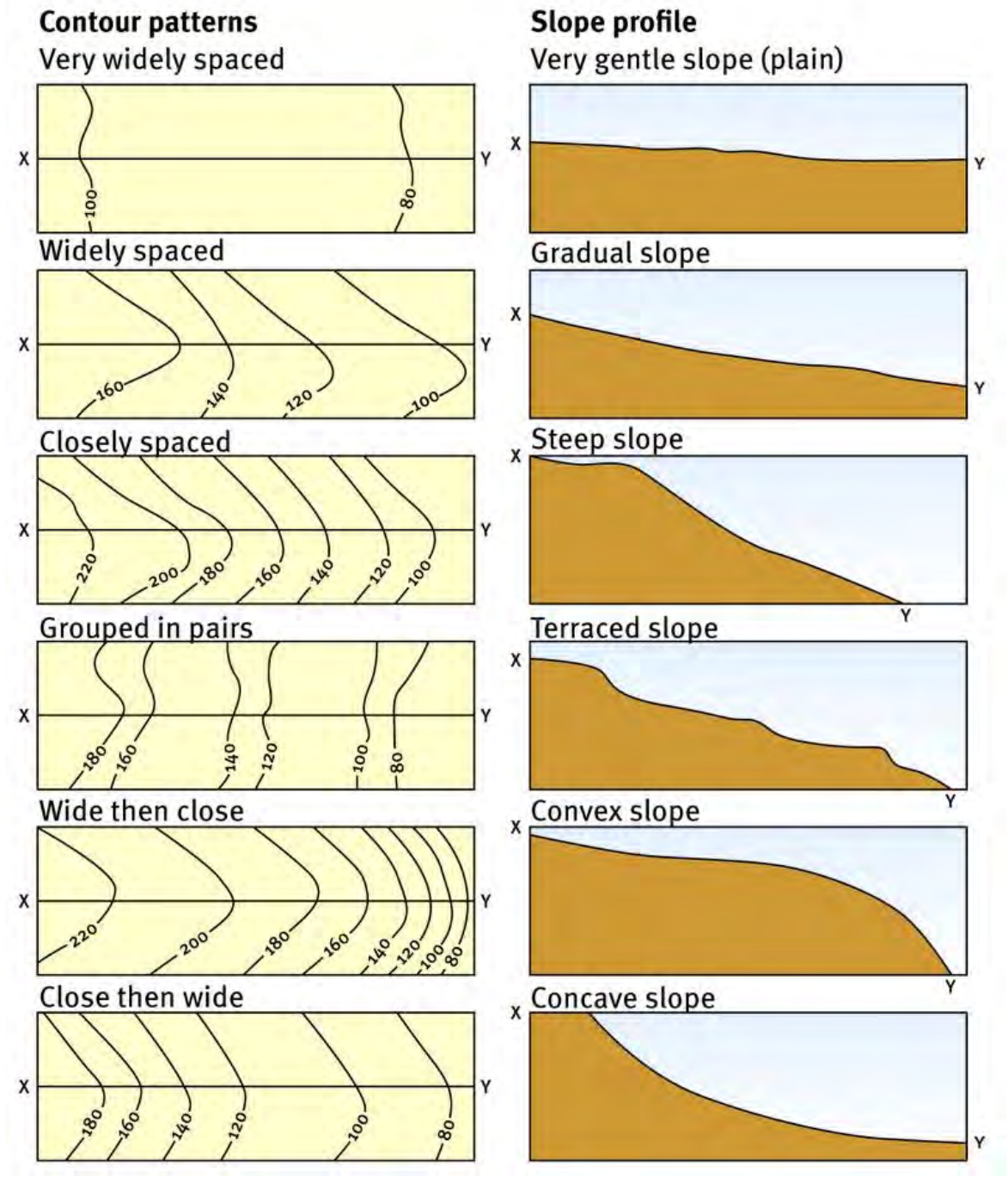


Figure 2 Contour patterns and slopes

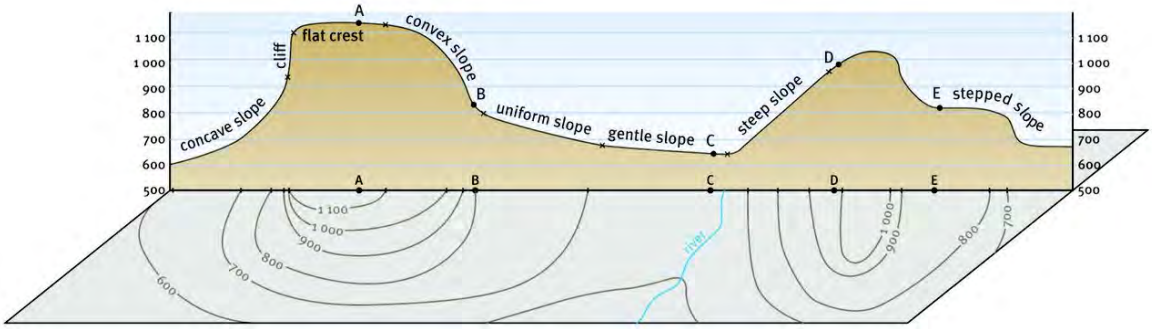


Figure 3 A cross section showing various slope profiles

2 How do we indicate direction?

Direction is locating a feature in relation to another one. When we refer to direction we use the points of a compass rose to describe the general direction from one feature to another.

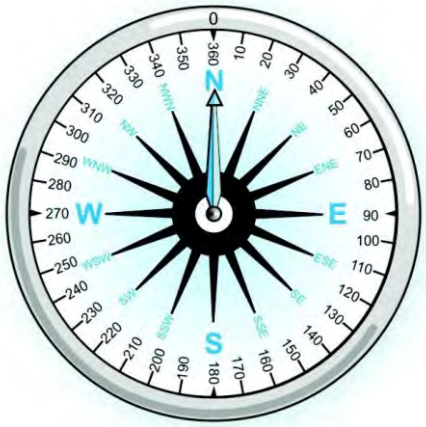


Figure 4 A compass rose is used to indicate direction

Bearing is a much more accurate way of indicating direction. Bearing is an angle measured clockwise from magnetic north (magnetic bearing) or true north (true bearing) (Figure 5). The starting point to determine bearing is the north-south line. North will then always be 0°. Bearing is always measured clockwise from north at 0° through a full circle to 360°. Bearings are measured using a protractor and given in degrees.

2.1 What is true north?

True north is also known as geographical north. It is the actual point on the Earth's surface that coincides with the north pole.

2.2 What is magnetic north?

Magnetic north is the northern magnetic pole of the Earth. Presently it lies approximately north west of Canada and about 1 000 km from the true north pole. Magnetic north is the north that a compass will point to and it shifts slowly east or west of true north.

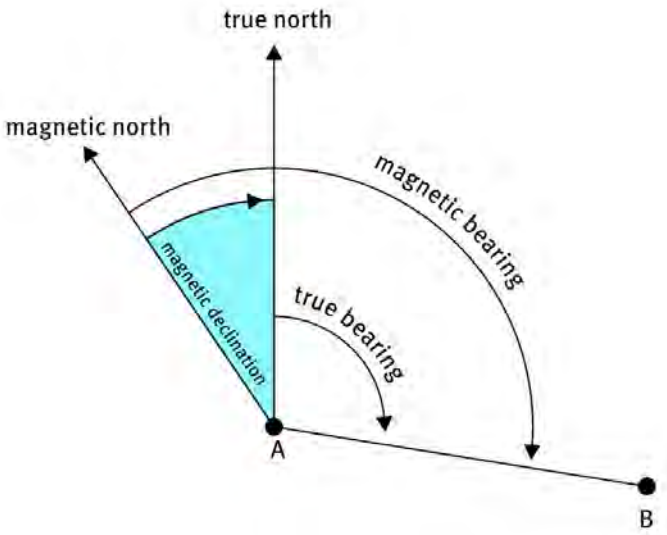
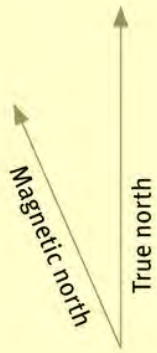


Figure 5 True north, magnetic north and true bearing

2.3 What is magnetic declination and how is it calculated?

Skills file How to calculate magnetic declination



1 Mean magnetic declination 23° 22' west of true north (July 2002)

2 Mean annual change 12' westwards (2000–2005)
(Supplied by Hermanus Magnetic Observatory)

1 Determine the difference in years. Current year minus first date in brackets.

2 Multiply these years with the mean annual change.

3 Add or subtract this total annual change from the magnetic declination.

If the average change is westwards – ADD!

If the average change is eastwards – SUBTRACT!

1 2010 – 2002 = 7 years

2 Annual change 12' west

7 × 12' = 84'

84' = 1° 24'

3 Annual change is west
ADD to magnetic declination

23° 22' + 1° 24' = 24° 46'

NB
1° = 60'

3 What is grid referencing?

The absolute position of any place can be located by determining the latitude and longitude of the place. This consists of latitude north or south of the equator.

- All latitudes in South Africa are south of the equator.
- All longitudes in South Africa are east of Greenwich, or the Prime Meridian.

How to determine location accurately

1 Draw a very light pencil line in the minute frame (that surrounds the map on the outside) opposite the relevant feature. Do this for both the latitude (left or right) and the longitude (top or bottom).

2 Start by counting the latitude minutes from the top of the map to the minute section directly opposite the geographic object in question marked with the pencil line.

3 Subdivide the minute section as follows:

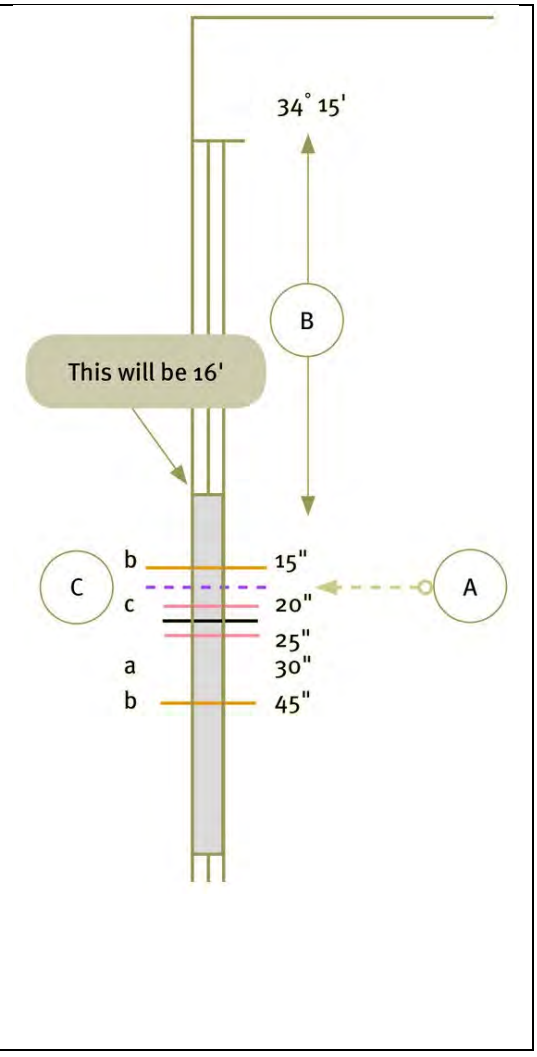
a Divide it halfway – this will be the 30" value.

b Divide each half (30") into two (quarters). These will be the 15" and 45" values respectively.

c Divide the relevant quarter (where the pencil line has been drawn) now into three equal parts that will each represent 5".

4 The correct number of seconds can now be easily and accurately determined as 18". The latitude value will then be 34° 16' 18" S.

5 To determine the longitude value, repeat these steps by counting the minutes from left to right.



4 Map and photo interpretation

Questions on map interpretation can be set from anywhere in the Grade 12 syllabus. You should use the topographic maps, aerial photographs and orthophoto maps in Via Afrika Geography Grade 12 to work through Table 1, finding as many examples as possible.

Table 1 How to systematically read and analyse a map or aerial photograph	
Climate and weather	
Position	latitude (climate of place) and longitude; proximity of mountains and oceans; distance from the sea (maritime or continental)
Rainfall	*year round*: perennial rivers; *seasonal* (summer or winter): farm dams, irrigation, non-perennial rivers, agronomy; *dry to arid*: wind pumps, large farms, stock farming; *sufficient rain*: forests (>750 mm)
Temperature	latitude position determines how cold/cool/hot a place is; height above sea-level (cold or warm) and slope front (shadows or sunlight); temperature inversions at night
Wind	rows of trees or windbreaks; landing strips and aerodromes; valley winds: catabatic (night) and anabatic (day)
Relief and topography	
Regions	mountains and plains, high and lowlands, highest and lowest points
Terrain forms	size, average height above sea-level, extent (direction)
Slope	steepness, convex, concave, straight, uniform, slope type (crest, cliff, talus slope, knickpoint, pediment)
Type of landform	valley, spur, gorge (ravine), cliff, waterfall, terrace, saddle (neck), pass
Landscape	mountainous, undulating, hills, plains, floodplains
Landforms associated with structural landscapes	
Horizontal strata	plateaux, table mountains (mesas), buttes, conical hills
Inclined strata	cuestas, homoclinal ridges, hogsbacks, dip slopes and scarp slopes
Massive igneous rock	dome shaped landforms (batholiths, laccoliths, lopoliths), tors, dykes
Fluvial process	
Drainage basins	watersheds, trunk (main) and tributary rivers
Stream pattern	dendritic, trellis, radial, rectangular, centripetal, deranged
Stream orders	lengths, number, gradient, basin area
Stage and shape	length-profile (upper, middle lower course) cross-profile (V-shaped, broad/wide)
Features	waterfalls, rapids, braided streams, undercut river bank, slip-off river bank,

	meanders, flood plains
Stream direction	always to the sea; from high to low areas; contours bend upstream; dam wall on the downstream side; tributaries join trunk with an acute angle
Stream piracy	watershed, capturing river, misfit stream, elbow of capture, wind gap
Features of the fluvial cycle stages	
Upper course	high watersheds, V-shaped valleys, steep gradient, short, small and many tributaries, waterfalls and rapids, fast flow, erosion vertical
Middle course	gentle slopes, watershed on lower levels, open valleys, longer and less tributaries, gentle river bends, erosion and transport start to be sideways
Lower course	broad valleys, gentle gradients, flood plains, meanders and oxbow lakes, deposition, slow flow, braided streams
Settlements	
Site	physical nature of the exact piece of land on which a settlement is located
Situation	relationship of a settlement with its immediate and wider environment (geographic placement with reference to relief, drainage, transport routes, and utilisation of soil)
Function	unifunctional (rural with primary activities); multifunctional (urban with secondary, tertiary and quaternary functions)
Rural settlement	
Patterns	dispersed/isolated (buildings far from each other), farmsteads; nucleated/clustered (buildings close to each other), farm villages
Factors determining site	drinking water, plough land, grazing land, building material, fuel
Factors determining shape	linear (road, river, mountains, sea); circular (central point – town square, market, church); crossroad (junction/intersection of roads)
Urban settlements	
Factors determining site	water supply, nature of soil, relief (flat surface), roads, rivers, railway lines, sea, defensibility, function
Type	central place, commerce, transport, specialised
Morphological structure	shape (circular, linear, star shaped); street plan (grid, radial, irregular); physical expansion (commercial ribbon development, multiple cores, exclusive residential and work areas, residential differentiation)
Land use zones	central business district, retail area, residential, light and heavy industries, rural-urban fringe
Economic activities	
Primary activities	*commercial* – good infrastructure, irrigation, large farms, winery, saw mill, sugar mill, abattoir, mines, fishing harbours, and so on; *subsistence* – few roads, no power lines, footpaths, small areas of cultivated fields

Secondary activities	*light industries* – close to CBD, road transport, raw materials agriculture; *heavy industries* – far from CBD, rail transport, raw materials, mainly mining; *factors influencing site* – level area, raw materials, transport, electricity, water, market
Tertiary activities	provision of services such as education (schools, colleges, universities), tourism, holiday resorts, commerce, medical and health care, airports, electricity supply
Also take note of the following	
• Tourist attractions, holiday resorts and monuments • Recreation facilities such as sport stadiums, golf courses, racetracks, shooting ranges • Airports and aerodromes are determined by flat surfaces, far from build-up areas (safety and noise) • Uses of large dams: drinking water; water purification plants; irrigation: canals and furrows, cultivated fields and orchards; recreation: camping sites, sail and ski (slipways), and angling • Infrastructure: type and number of roads, railway lines, power lines, harbours as well as how infrastructure relates to the topography and drainage	

Unit 2 Topographic maps

1 What are the conventional map signs and symbols?

Every 1:50 000 topographic map has a key or reference at the bottom of the map (Figure 6). The reference explains the symbols used on the map and helps you to understand the map information.

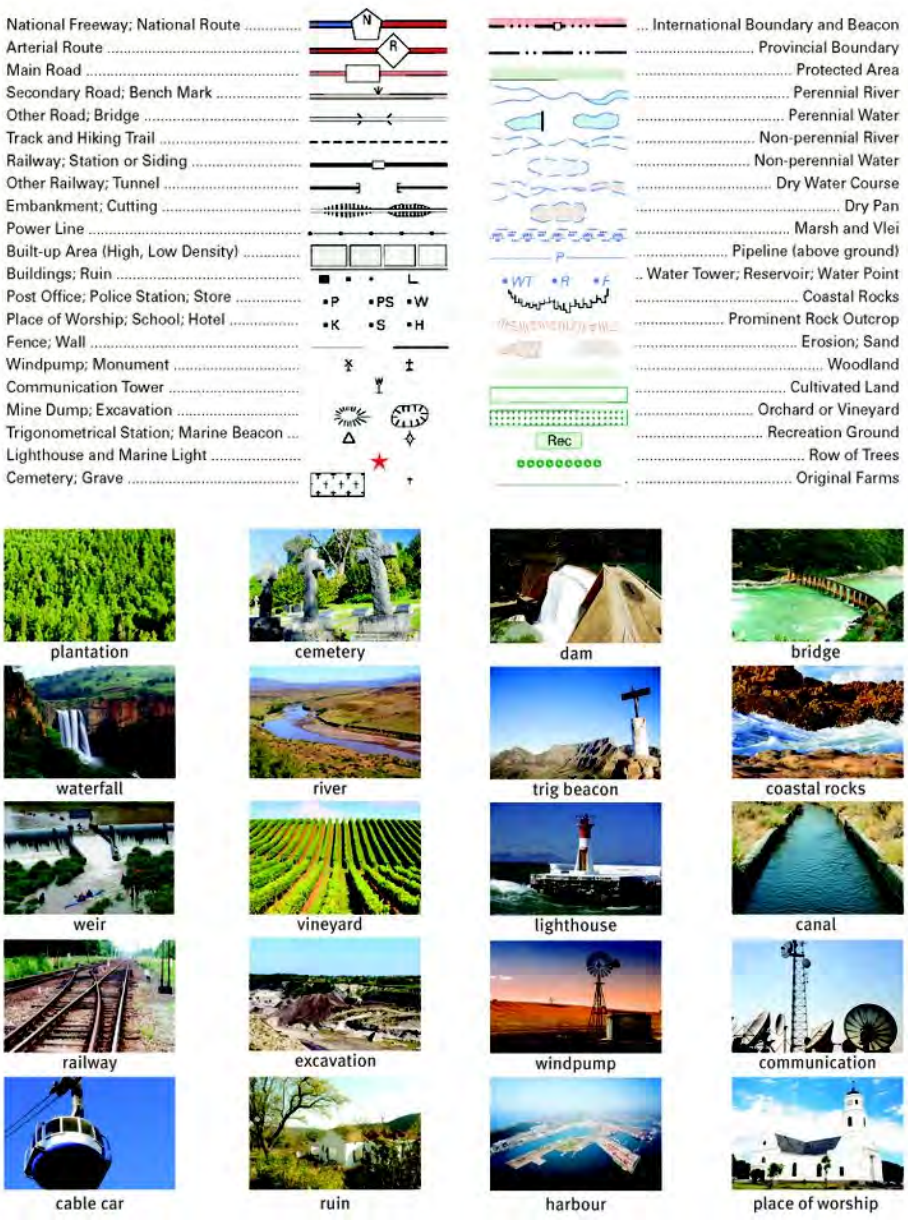


Figure 6 1:50 000 topographic map symbols and images of what some of them represent

2 What are contours and landforms?

Maps are two dimensional representations on a flat sheet of paper but height can be shown by spot heights, bench marks, trigonometrical beacons and contours.

2.1 How are landforms recognised on a topographic map?

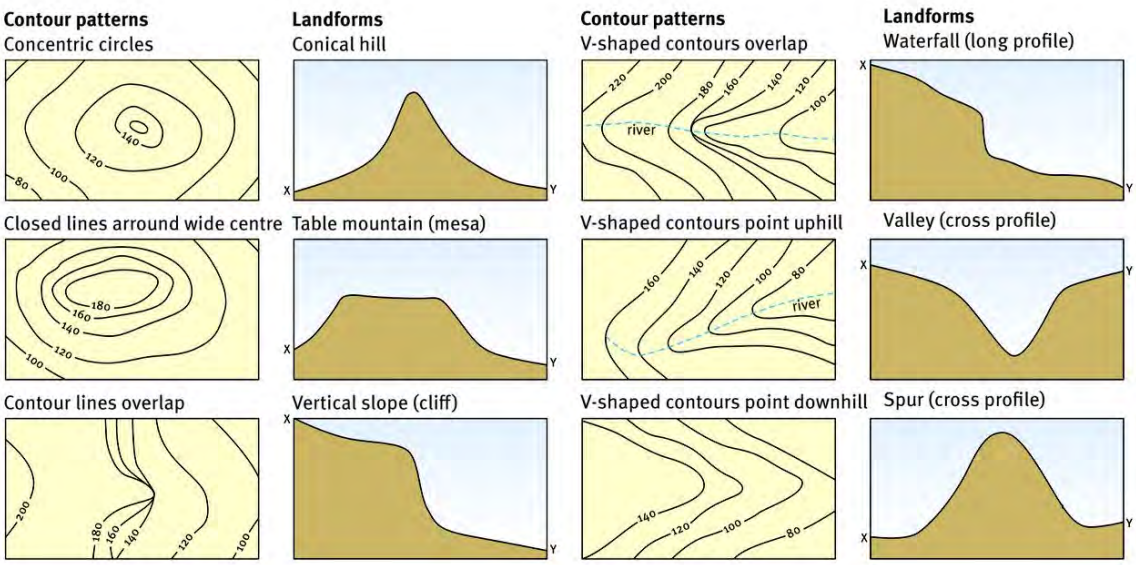


Figure 7 Contours and their landforms

3 How do you construct cross-sections from 1:50 000 maps?

Cross-sections are constructed in four steps, illustrated in Figure 8 on the next page.

1 Prepare the profile framework.
2 Gather the data.
3 Transfer the data.
4 Complete the profile.

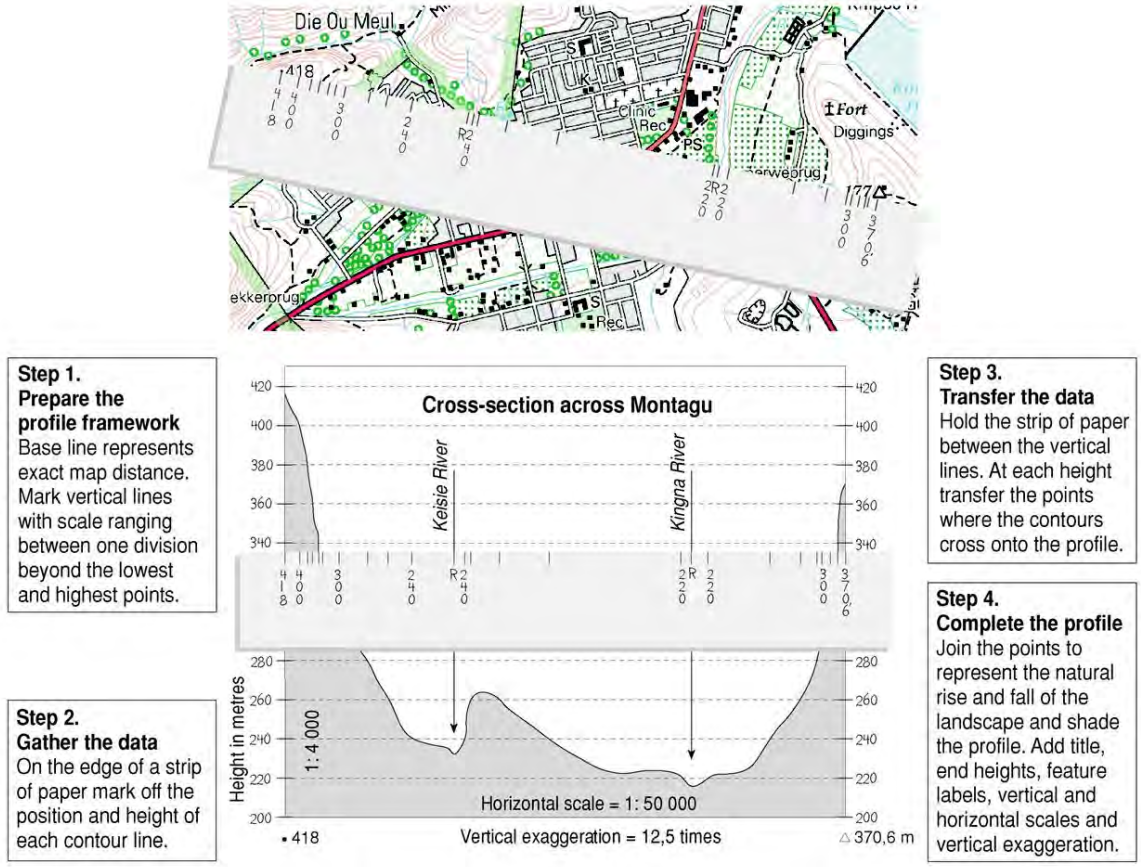


Figure 8 Four steps to construct a cross-section across 3320CC Montagu

4 What is vertical exaggeration?

Vertical exaggeration is the deliberate vertical expansion of the cross-section's vertical scale in order to see height variations more clearly (Figure 9). Vertical exaggeration is calculated by dividing the vertical scale by the horizontal scale, where both scales are expressed as representative fractions.

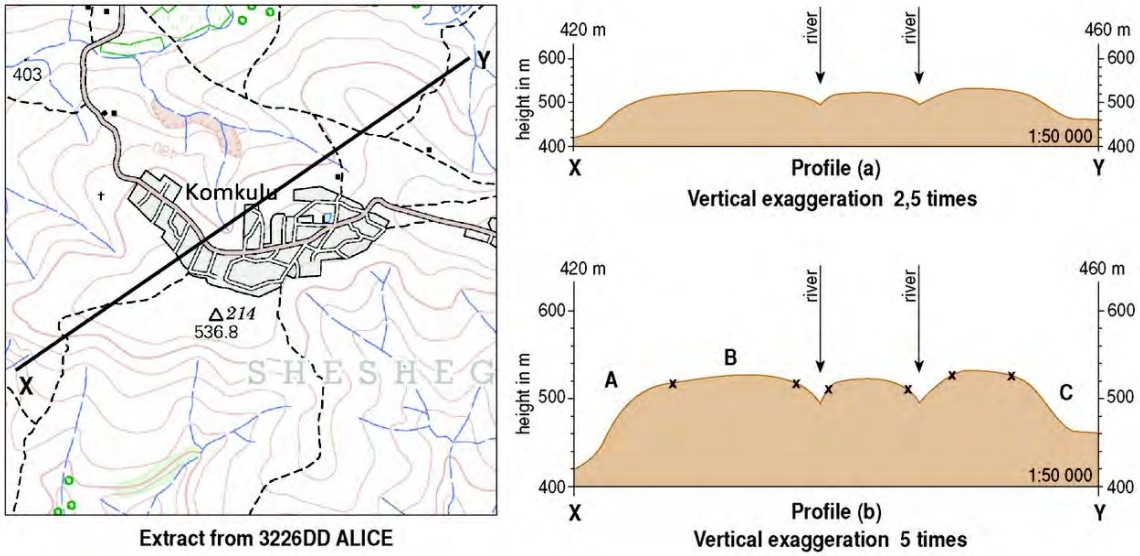


Figure 9 Cross section X–Y shown at different vertical exaggerations

4.1 Calculating vertical exaggeration

$$\frac{vertical\ scale}{horizontal\ scale} = \frac{1}{2\ 000} \div \frac{1}{50\ 000} = \frac{50\ 000}{2\ 000} = 25\ times$$

5 What is intervisibility?

Intervisibility is when you can see one point from another and it can be determined by examining the contours.

- Two points of the same height are intervisible if there is no higher terrain between them.
- Where contours show a convex slope, the summit of the hill is not visible from the foot of the hill.
- Where contours show a concave slope the summit and foot of the hill are intervisible.

6 What is gradient?

Gradient is the relationship between height and distance. It is written as a ratio. The gradient tells us how steep a straight line is. We calculate gradient to find out how steep or gentle a slope is. An easy way to remember the ratio for gradient is RISE:RUN. Learn this formula and write it down when doing gradient calculations. You might be given a mark even if you get the calculation completely wrong.

Calculating gradient			Calculate the gradient between the top of a slope (490 m) and the foot of the slope (430 m). Horizontal distance between spot heights is 2,1 cm measured on 1:50 000 map.	
Vertical distance (RISE)		:	**Horizontal distance (RUN)**	
Height at top of slope	490 m		2,1 cm	Map distance between top and bottom of slope
Height at bottom of slope	430 m		$\frac{2{,}1 \text{ cm} \times 50\,000}{100}$	(always convert to same unit of measurement)
RISE	60 m	:	1 050 m	**RUN**
Reduce height to 1, divide both sides by the height value	$\frac{60}{60}$	:	$\frac{1\,050}{60}$	
Gradient of slope =	1	:	17,5	
Gradient expressed as a fraction			$\frac{1}{\mathbf{17{,}5}}$	

Unit 3 Aerial photographs and orthophoto maps

Orthophotos are aerial photographs with the distortions caused by camera angle removed so they are true to scale. An orthophoto map has added details such as contour lines, place names, spot heights and trigonometrical stations added. They are drawn to a scale of 1:10 000.

Unit 4 Geographical information systems

GIS is a computerised system consisting of hardware, software and methods designed to capture, manage, manipulate, analyse, model and display spatial and non-spatial data to solve planning and management problems.

Table 2 Key terms in GIS

Concept	Term
Spatial data	This is all data that are shown with symbols on a map. The spatial data for a school could be its exact latitude and longitude.
Attribute or non-spatial data	This is that information which describes the spatial characteristics of the spatial features. The attribute data for a school could that it is a high school for 345 boys and 360 girls.
Vector data	This is data of geographic features shown in point (a node such as a school), line (an arc such as a river) and area (a polygon such as a dam) format.
Raster data	This is data of geographic features shown with grid cells.
Spatial resolution	This determines how clear and easy the detail is to see.
Buffering	This is the creation of a zone of equal width around a point, line or area feature in GIS. An example of buffering is where it is not allowed to plant any trees in a plantation closer than 50 metres from any river.
Remote sensing	This is the gathering of information about the Earth from weather balloons, aeroplanes and satellites.
Data or thematic layering	This is when different types of information are placed one on top of the other in layers to see the overall picture. Such layers on a topographic map could be: vegetation, contour lines, roads, rivers or built up areas.

Work through the activities on GIS in the Learner's Book on pages 51, 247 and 253 to revise this topic. There will always be questions on GIS in Exam Paper 2 and they could also appear in Exam Paper 1.

Questions

Work through the map interpretation questions of the June and End-of-year exam papers. These exams are similar to those one will get in Grade 12. Also answer the multiple choice questions below, which are good revision work.

Question 1

Show the letter corresponding to the best answer to the questions below.

1.1 Which of the following scales is the best representative of a small-scale map?

A 1 cm to 1 km

B 1:1,000,000

C 1:50 000

D 1:10 000

E 1 cm to 20 m

1.2 A large-scale map shows ...

A a large amount of detail for a large amount of area

B a large amount of detail for a small amount of area

C a small amount of detail for a large amount of area

D a small amount of detail for a small amount of area

1.3 Which of the following representative fractions would show the most detail on a map?

A 1:1 000 000

B 1:10 000

C 1:50 000

D 1:10 000 000

1.4 The ratio between the measurement of something on the map and the corresponding measurement on the earth is known as ...

A distance

B direction

C projection

D scale

E GIS

1.5 How are latitude and longitude lines drawn on a globe of Earth?

A latitude lines are parallel and longitude lines meet at the poles

B latitude lines are parallel and longitude lines meet at the equator

C longitude lines are parallel and latitude lines meet at the poles

D longitude lines are parallel and latitude lines meet at the equator

1.6 An airplane takes off from a location at 17° S latitude and flies to a new location 55° due north of its starting point. What latitude has the plane reached?

A 28° N

B 38° N

C 72° S

D 72° N

E 38° S

1.7 Which of the following are correct latitude and longitude coordinates?

A 110° N, 78° E

B 110° N, 78° N

C 5° N, 120° W

D 100° S, 123° N

1.8 Figure 1 shows various compass readings. N represents true north.

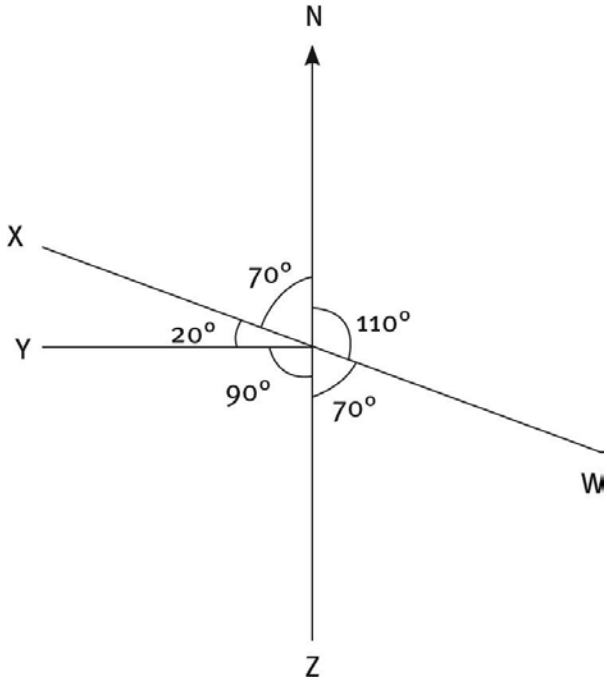


Figure 1

1.8.1 In Figure 1 the true bearing of X from O is ...

A 110°

B 290°

C 90°

D 700°

1.8.2 In Figure 1 the true bearing of Y from O is ...

A 270°

B 160°

C 90°

D 70°

1.8.3 In Figure 1 the true bearing of O from X is ...

A 110°

B 250°

C 90°

D 70°

1.8.4 In Figure 1 the true bearing of O from Z is ...

A 0°

B 180°

C 90°

D 270°

1.8.5 In Figure 1 the true bearing of O from W is ...

A 110°

B 250°

C 290°

D 270°

1.9 Figure 2 shows a cross section line which has been drawn through a series of contour lines (interval 100 m). Three places, X, Y and Z are marked on the line.

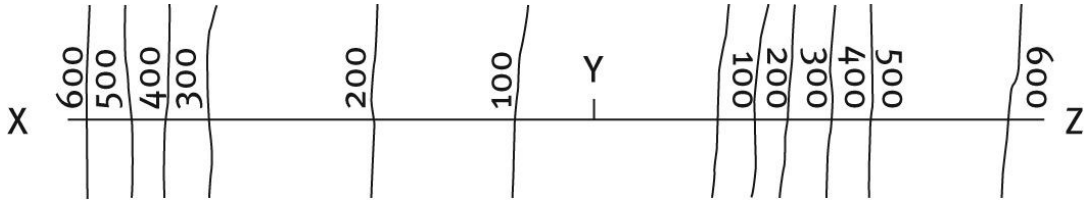


Figure 2

1.9.1 In Figure 2 which of the following statements is true?

A Y is equally distant from X and Z

B Y is just visible from Z

C X is not visible from Y

D Y is visible from X

Y Z is visible from Y

1.9.2 In Figure 2 the slope from X to Y is ...

A stepped

B uniform

C concave

D convex

1.9.3 In Figure 2 the slope from Z to Y is ...

A stepped

B uniform

C concave

D convex

1.10 Figure 3 shows a contour map with four spot heights, W at 218 m, X at 140 m, Y at 183 m and Z at 235m.

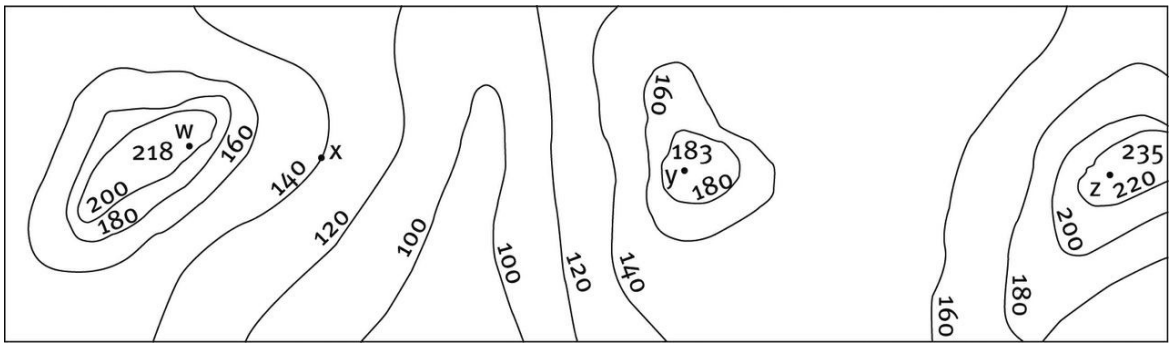


Figure 3

1.10.1 In Figure 3 which of the following lines of sight does NOT have intervisibility?

A WX

B YW

C ZX

D ZW

E XY

1.10.2 The contour interval represents the ...

A accuracy of the surveying work

B horizontal spacing between the contour lines

C number of contour lines on a map

D vertical spacing between contour lines

E none of these

1.10.3 Contour lines on a topographic map that are close together indicate that ...

A the land slopes gradually

B the land is very steep

C the elevation is very high

D the elevation is very low

1.10.4 Contour lines on a topographic map that are spread far apart indicate that ...

A the land slopes gradually

B the land is very steep

C the elevation is high

D the elevation is low

1.10.5 Contour lines ...

A can never cross

B can cross in very steep areas

C can cross on very precise maps

D can cross where there are cliffs

20×2=(40)

TOTAL MARKS [40]

Answers to Questions

1.1	B	(2)
1.2	B	(2)
1.3	B	(2)
1.4	D	(2)
1.5	A	(2)
1.6	B	(2)
1.7	C	(2)
1.8.1	B	(2)
1.8.2	A	(2)
1.8.3	A	(2)
1.8.4	A	(2)
1.8.5	C	(2)
1.9.1	D	(2)
1.9.2	C	(2)
1.9.3	D	(2)
1.10.1	C	(2)
1.10.2	D	(2)
1.10.3	B	(2)
1.10.4	A	(2)
1.10.5	A	(2)
		20×2=(40)
		TOTAL MARKS [40]

Topic 1 Climate and weather

Unit 1 Mid-latitude cyclones

1 General characteristics

- Mid-latitude cyclones are also known as frontal depressions, depressions and extra-tropical cyclones. They are low pressure systems (lows) associated with the meeting of warm and cold air masses.
- As the two air masses have different densities, they do not mix readily but will be 'separated' by a front.
- In the Southern Hemisphere winds rotate clockwise into the centre of the low. In the Northern Hemisphere winds rotate anti-clockwise into a low.
- The diameter of mid-latitude cyclones ranges from 1 000 to 4 000 km.
- They occur all year round, but in South Africa their influence is strongest in winter, bringing the familiar cold fronts often accompanied by rain. In summer they move further south of the country.
- These travelling cyclones range in strength from a mild disturbance to a powerful storm.

1.1 Definitions

- **Cyclone:** A cyclone is an area of low pressure usually associated with wet and windy weather.
- **Front:** A front is a boundary separating two air masses with different temperature and moisture characteristics.
- **Warm front:** A warm front is found where warm air replaces cold air.
- **Cold front:** A cold front is found where cold air replaces warm air.

2 Where do mid-latitude cyclones form?

These weather systems occur between approximately 30° and 60° north and south of the Equator. In both hemispheres they move from west to east within the westerly wind belts (Figure 10).

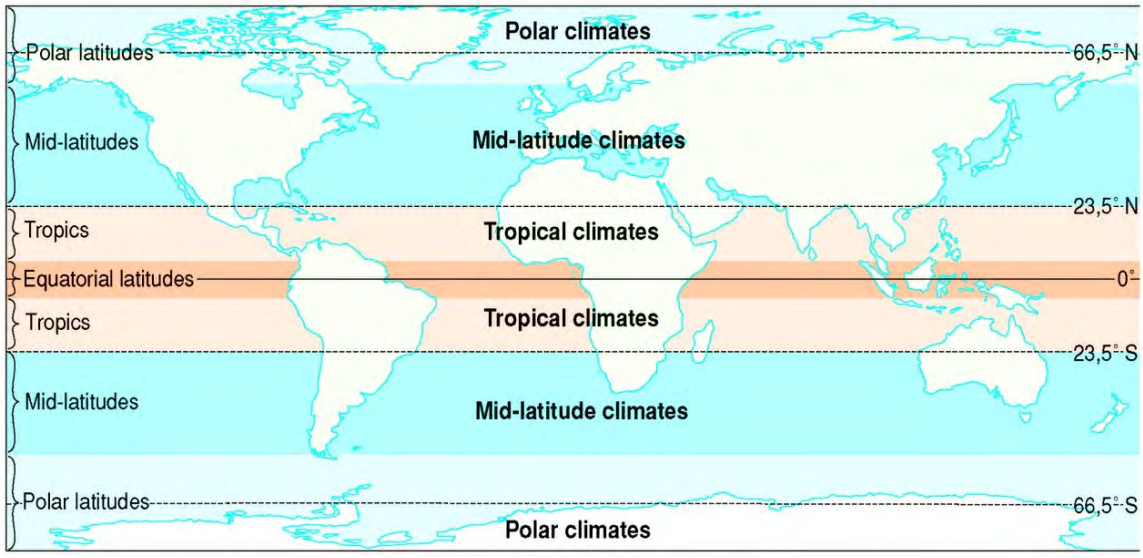


Figure 10 Mid-latitude climate zones (and other major latitudinal zones)

Sometimes a series of fronts will develop, in which three or four fronts follow one after the other in a 'family' of fronts. In the Southern Hemisphere the oldest frontal system (which arrives first) will be furthest towards the south-east. Each younger member is slightly further north and west than its predecessor (Figure 11).

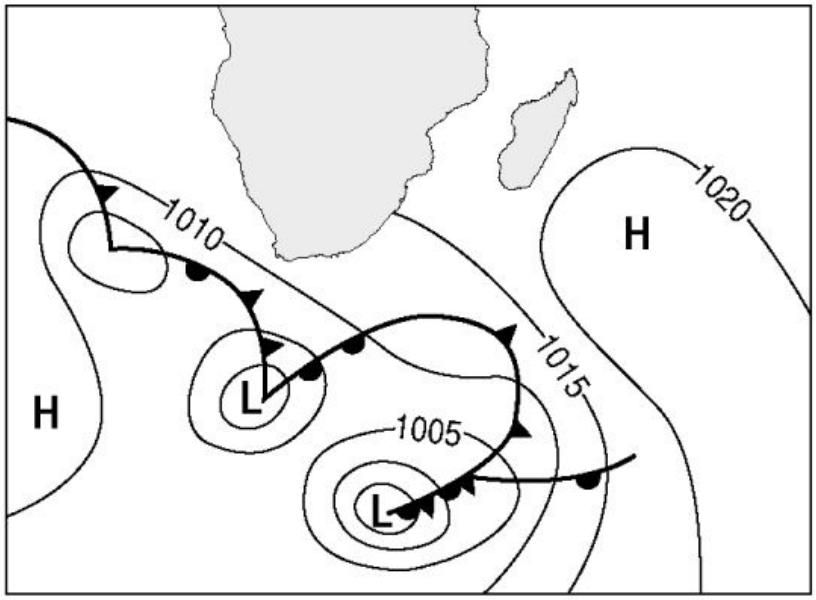


Figure 11 A family of fronts

3 What are the conditions necessary for the formation of mid-latitude cyclones?

A mid-latitude cyclone is a large spiral of air that forms and breaks up, along the polar front. The conditions favourable to the formation of a mid-latitude cyclone are:

- Two large high pressure systems (anti-cyclones) are in contact on the polar front.
- The warm, subtropical high pressure contains a warm, moist maritime air mass.
- The polar high pressure contains a cold, dry air mass.
- The air flow converges from opposite directions on the two sides of the polar front.
- Disturbances on the polar front cause a local low pressure into which air will flow and around.

4 What are the stages of development and related weather conditions of mid-latitude cyclones?

The diagrams below show the four stages in the development of a mid-latitude cyclone.

4.1 The initial stage

- Warm, moist subtropical air meets cold, drier air along a stationary polar front.
- There is no movement across the polar front (Figure 12).
- The air masses do not mix, but move parallel to each other in opposite directions on both sides of the front.

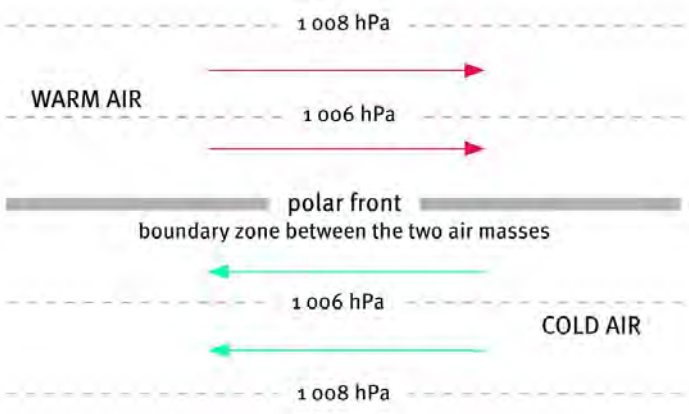


Figure 12 The initial stage

4.2 Development or wave stage

- A disturbance occurs on the polar front and it now has a wave-like appearance (Figure 13).

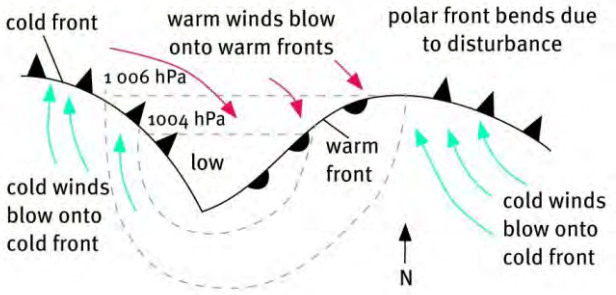


Figure 13 The development or wave stage

4.3 Mature stage

- Cold air moves in a northerly direction, west of the low pressure centre. A cold front develops.
- Warm air is pushed in a southerly direction, east of the low pressure centre. A warm front develops.
- Winds blow clockwise around and into the low pressure, in the Southern Hemisphere (Figure 14).

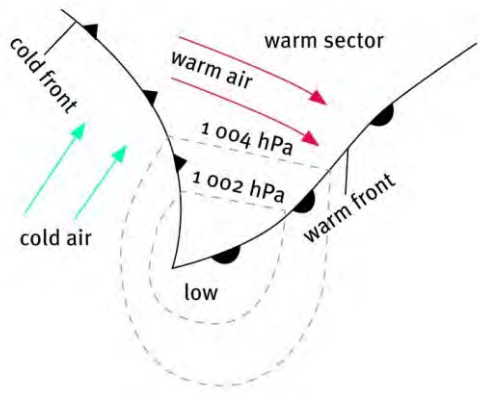


Figure14 The mature stage

4.4 Occluded stage

- Cold air wedges in under the warm air, lifts it up and isolates the warm air from the Earth's surface. This process is called occlusion. The front that is formed is called an occluded front (Figure 15).
- Figure 16 shows what happens three-dimensionally as the system develops to the occlusion stage.

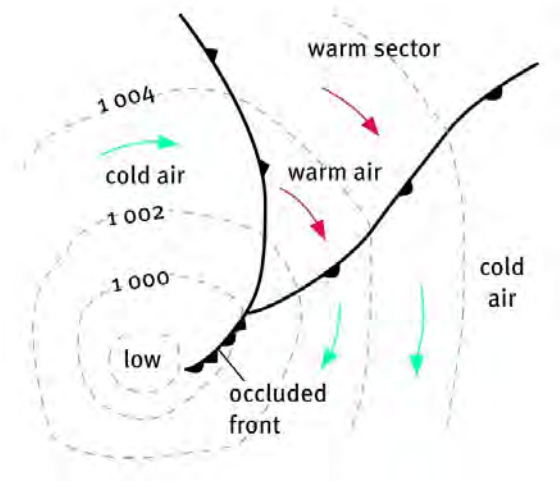


Figure 15 The occlusion stage

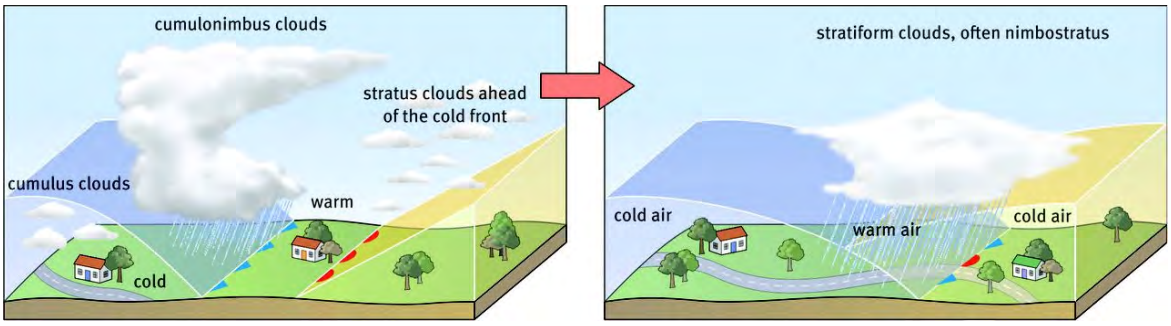


Figure 16 A three-dimensional representation of the occlusion process

4.5 Dissipating stage

In the dissipating stage, cold air completely isolates warm air from the ground as all the warm air has been lifted high above the ground (Figure 17).

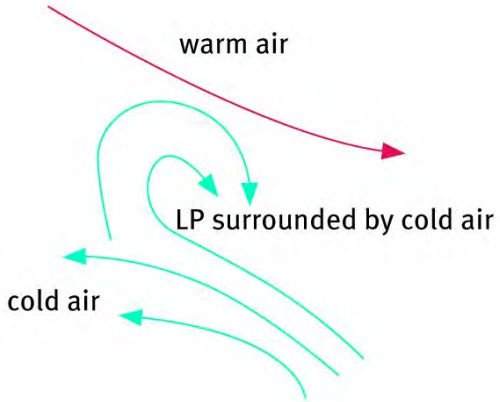


Figure 17 The dissipating stage

5 What is the weather associated with mid-latitude cyclones?

Questions on the weather associated with mid-latitude cyclones and the reasons are often set in exams and you should make sure you know and understand Tables 3 and 4.

Table 3 The weather associated with mid-latitude cyclones

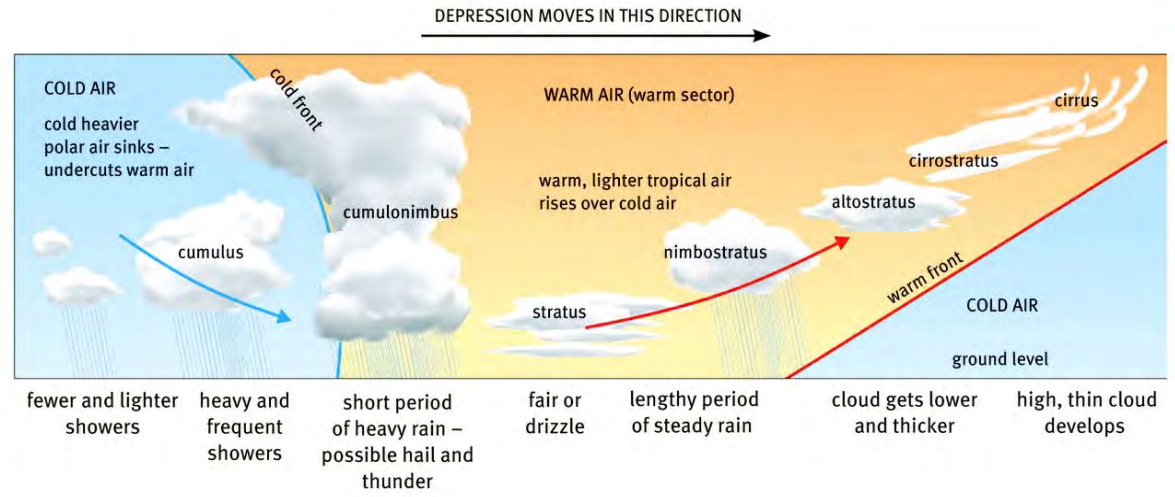


Figure 18 The weather associated with a passing mid-latitude cyclone

As the cold front approaches	Warm sector	As the warm front approaches
• The temperature falls. • The warm air rises and cumulonimbus clouds start to form. • The pressure starts to drop. • Rain falls. • There is a drop in humidity. • The wind backs and becomes south westerly.	• The temperature is at its highest. • The pressure is at its lowest. • The wind is northerly or north westerly.	• The temperature is low but rises slowly. • Rain falls. • The wind is north easterly. • Warm front conditions are seldom experienced over South Africa as they are usually too far south.

Table 4 Reasons for weather changes at the cold front

Changes	Reasons
Temperature falls.	The cold air behind the cold front has arrived.
Wind backs.	Air blows in a clockwise direction around a Southern Hemisphere low pressure system.
Cloud cover increases.	The warm rises over the cold air, is cooled and condenses.
Pressure drops.	Pressure is at its lowest just ahead of the cold front.
Rain falls.	If the rising air is sufficiently moist and unstable heavy rain falls.

Unit 2 Tropical cyclones

1 What are the general characteristics of tropical cyclones?

Tropical cyclones cause considerable loss of life and damage to property, vegetation and economic activities, mostly along the east coasts of continents.

- Tropical cyclones are intense low pressure systems.
- They originate in late summer or autumn over warm tropical oceans (at least 26 °C), except in the southern Atlantic Ocean.
- They need Coriolis force to form, which is zero within 5° of the Equator, so they develop within latitudes 5° and 20° N and S.
- They move westwards at a rate of 40–200 km a day. Near 20–30° N and S, they tend to curve back eastwards at a rate of 500–700 km/ day.
- As low pressure areas, their rotation is clockwise in the Southern Hemisphere and anti-clockwise in the Northern Hemisphere.
- The source of energy in tropical cyclones is the large amount of latent heat released as rising warm, moist tropical air condenses.
- They are accompanied by heavy rain, storm surges and high winds.

2 Where do tropical cyclones form?

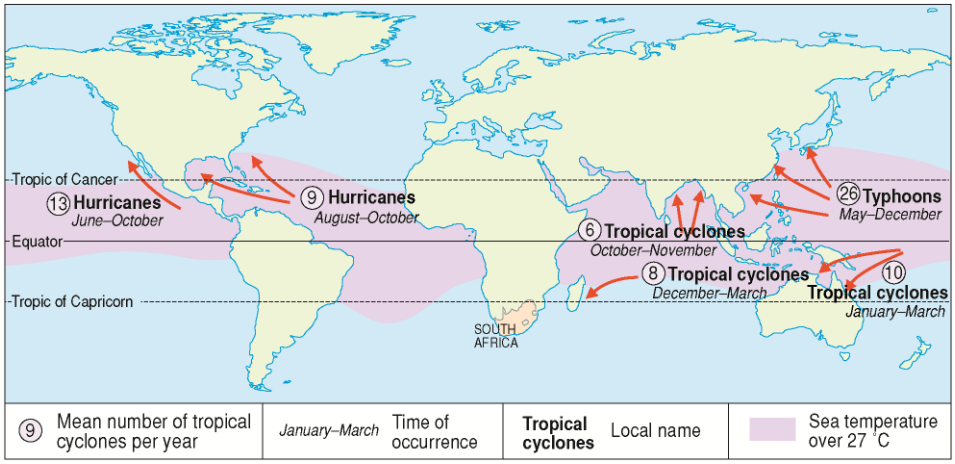


Figure 19 Tropical cyclones: global location and mean frequency

3 What are the factors necessary for tropical cyclones to form?

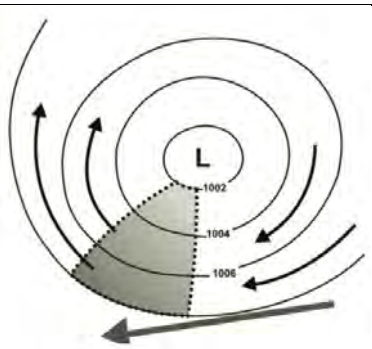
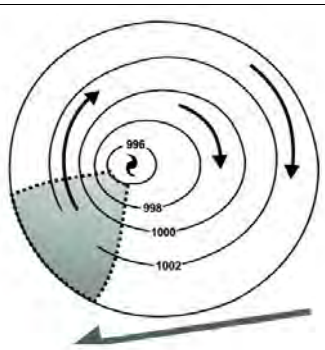
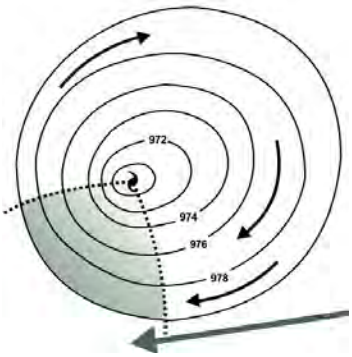
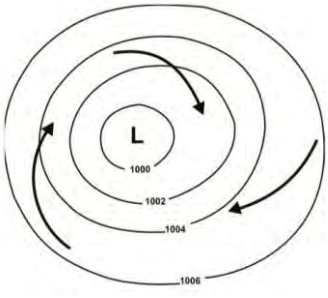
Exam questions are often set on the requirements and reasons for the formation of tropical cyclones and you should make sure you know and understand Table 5.

Table 5 Requirements and reasons for the formation of a tropical cyclone

Requirements	Reasons
Ocean temperatures over 27 °C	• Heat is needed for convection. • Friction is at a minimum over the ocean. • The air is heavily charged with water vapour in a tropical maritime atmosphere.
Unstable air	Atmospheric instability makes convection possible.
Very low pressure and steep pressure gradient	• Rapid convergence helps the air to rise. • The steep pressure gradient helps Coriolis Force to develop and causes the rotation.
An undisturbed period of several days	Time is needed for the slow convergence of warm moist air towards the low pressure centre.
Some upper-air triggering action	A strong horizontal divergence of air at upper levels stimulates the circulation and formation of a vortex.
Winds must be light and variable before the formative period.	Strong winds or winds from a constant direction: • will prevent the development of a vortex • disturb the low level distribution of water vapour • reduce the surface temperature of the water.

4 What are the stages of development of tropical cyclones?

The life cycle of a tropical cyclone, which may last a number of days, can be divided in four stages (Table 6). Nevertheless, unfavourable conditions may stop the development at any stage.

Table 6 The stages in the development of a tropical cyclone in the Southern Hemisphere	
Formative stage • The pressure is still above 1 000 hPa but dropping quickly. • Winds are already at gale force in the front left-hand quadrant.	
Developing stage • Pressure is now below 1 000 hPa and continuing to fall. • Winds are now hurricane strength in the front left-hand quadrant near the eye, with gales further away	
Mature stage • Pressure is now very low, as low as 900–940 hPa in the eye but has stopped falling. • Weather and winds (hurricane strength) are at their worst especially in the worst weather quadrant.	
Degenerating or dissipating stage • Pressure begins to rise. • Winds drop in strength. • There is still heavy rain. • The system is by probably over land or over cooler water and does receive latent heat.	

5 What are the associated weather patterns?

Table 7 Weather conditions at the passage of a tropical cyclone		
As the cyclone approaches	**As the eye is overhead**	**As the cyclone moves away**
• Temperature rises • Calm though there is a sea swell which begins to increase • High cirrus clouds on the horizon • Pressure begins to fall • Wind strength increases • Cumulonimbus clouds approach • Torrential rain • Storm surge swamps low lying areas • Temperatures drop.	• Temperatures increase slightly • Wind drops suddenly • Pressure is at its lowest • Light scattered cloud • Sunshine • Calm conditions for an hour or two	• First set of conditions repeated • Winds have reversed their direction • Conditions gradually improve until the cyclone has passed

6 A cross-section through a mature tropical cyclone

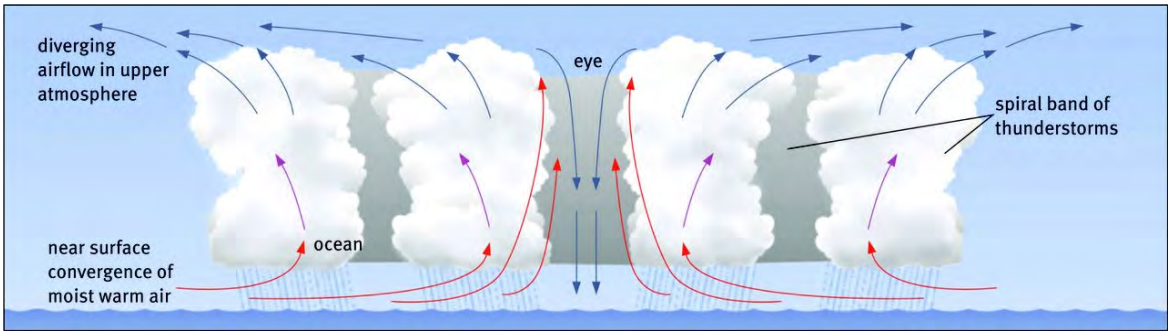


Figure 20 A cross-section through a tropical cyclone

7 How do you recognise tropical cyclones on synoptic maps?

Characteristics of a tropical cyclone on synoptic maps are:

- a low pressure cell with closed isobars between 5° and 30° N and S of the Equator (Figure 21)
- symbol for tropical cyclone in the eye (centre of low pressure)
- name of the tropical cyclone written next to system
- the date of the map in late summer or early autumn.

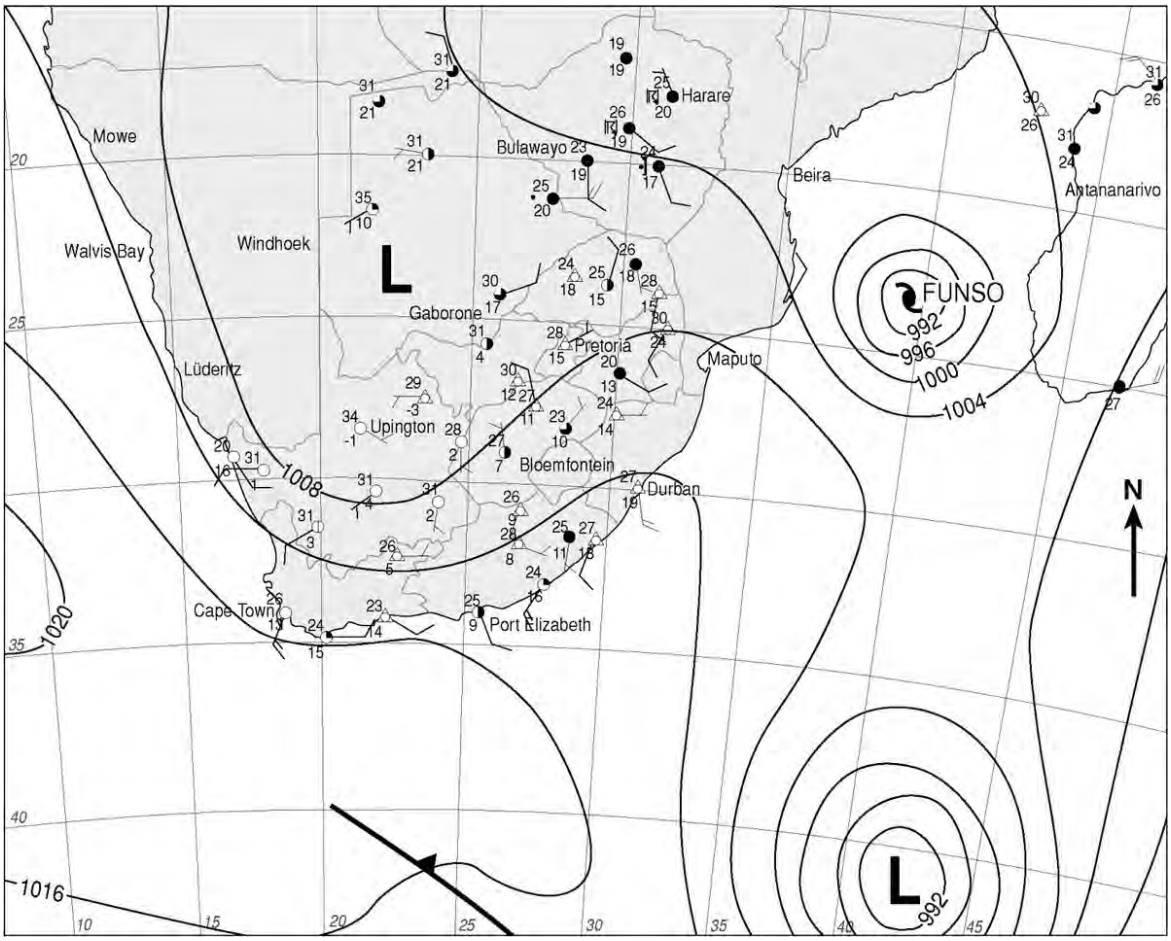


Figure 21 Synoptic weather map of 25 January 2012

8 What are the impacts of tropical cyclones on human activities and the environment?

Tropical cyclones are the most destructive natural hazards in terms of frequency and number of deaths. Not only people, but also the natural and constructed environments are affected. The main causes of the destruction are heavy rain, strong winds and, in coastal areas, the storm surge. The storm surge often causes the most damage.

In more developed regions, such as the USA, the damage is mainly monetary while in the less developed areas, such as Mozambique, there is more loss of life and less monetary damage.

9 What are the strategies to help prepare for and manage the effects of tropical cyclones?

Warnings about impending tropical cyclones are normally given by the local weather office. You should listen regularly to the radio and/or watch TV and pay attention to advice and instructions.

10 The differences between tropical cyclones and mid-latitude cyclones

Table 8 The difference between tropical cyclones and mid-latitude cyclones

	Tropical cyclones	**Mid-latitude cyclones**
Names	Typhoons (China, Japan) Hurricanes (America)	Extra-tropical cyclones, mid-latitude cyclones, depressions
Origin	Tropical oceans 5–30° N and S	At polar front 40–60° N and S
Pressure	Very low	Low
Pressure gradient	Very steep	Less steep
Movement	East to west carried by tropical easterlies	West to east carried by the westerlies
Wind speed	Very fast	Not as fast
Size	250–500km diameter	1000–3500 km diameter
Weather	Hot, destructive winds, heavy rain	Cool, cloudy and rainy

Unit 3 Subtropical anticyclones and associated weather

1 South Africa's climate and weather are determined by three controlling factors

- The influence of the surrounding ocean. The oceans moderate the temperatures of coastal areas. The warm Agulhas current promotes rainfall on the east while the cold Benguela current makes for a dry west coast.
- The plateau of the interior (altitude). Most of the interior of South Africa lies at an altitude of 1 500 metres above sea level. This lowers the temperature of the interior.
- The subtropical anticyclones. This means that South Africa generally has a dry climate with high temperatures.

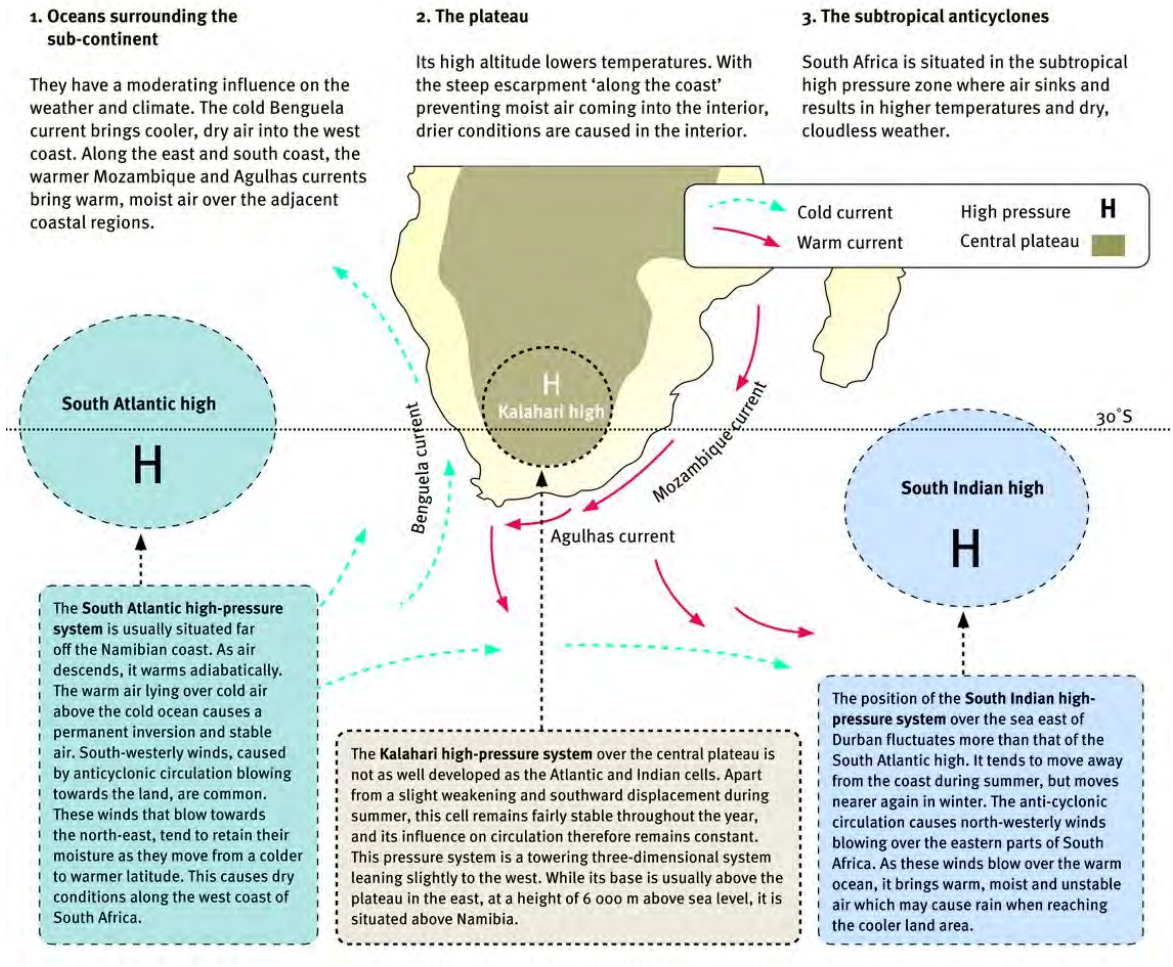


Figure 22 Main factors controlling South Africa's climate

2 What are the characteristics of the high pressure cells?

The high-pressure cells are weather systems characterised by:

- descending air (Figure 23)
- air that comes from the drier upper atmosphere
- descending air warming at around 1 °C / 100 m
- clear, sunny and dry weather conditions
- moving northwards in winter and southwards in summer.

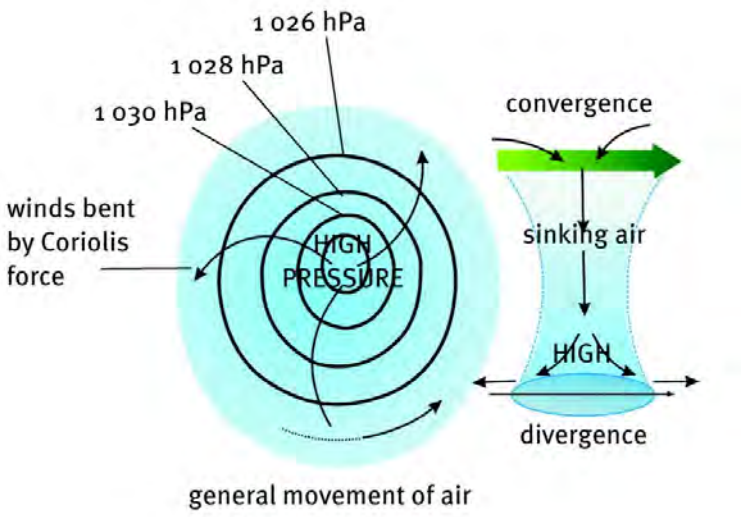


Figure 23 Air movements round a Southern Hemisphere anticyclone

3 How does the anticyclonic air circulation around South Africa influence the weather and climate?

Winter: Subsiding air in the Kalahari cell heats lower layers causing a dry interior. Because of the cold plateau with no rising air, an inversion layer is formed. This is often lower than the escarpment and prevents moist air moving in from the Indian Ocean.

Summer: The sinking air of the Kalahari high pressure cell is weaker. The plateau is hot and air rises, causing thermal lows. The inversion layer is now higher, above the escarpment. Warm, moist air can flow in from the ocean, causing extensive rainfall in the eastern part of the country.

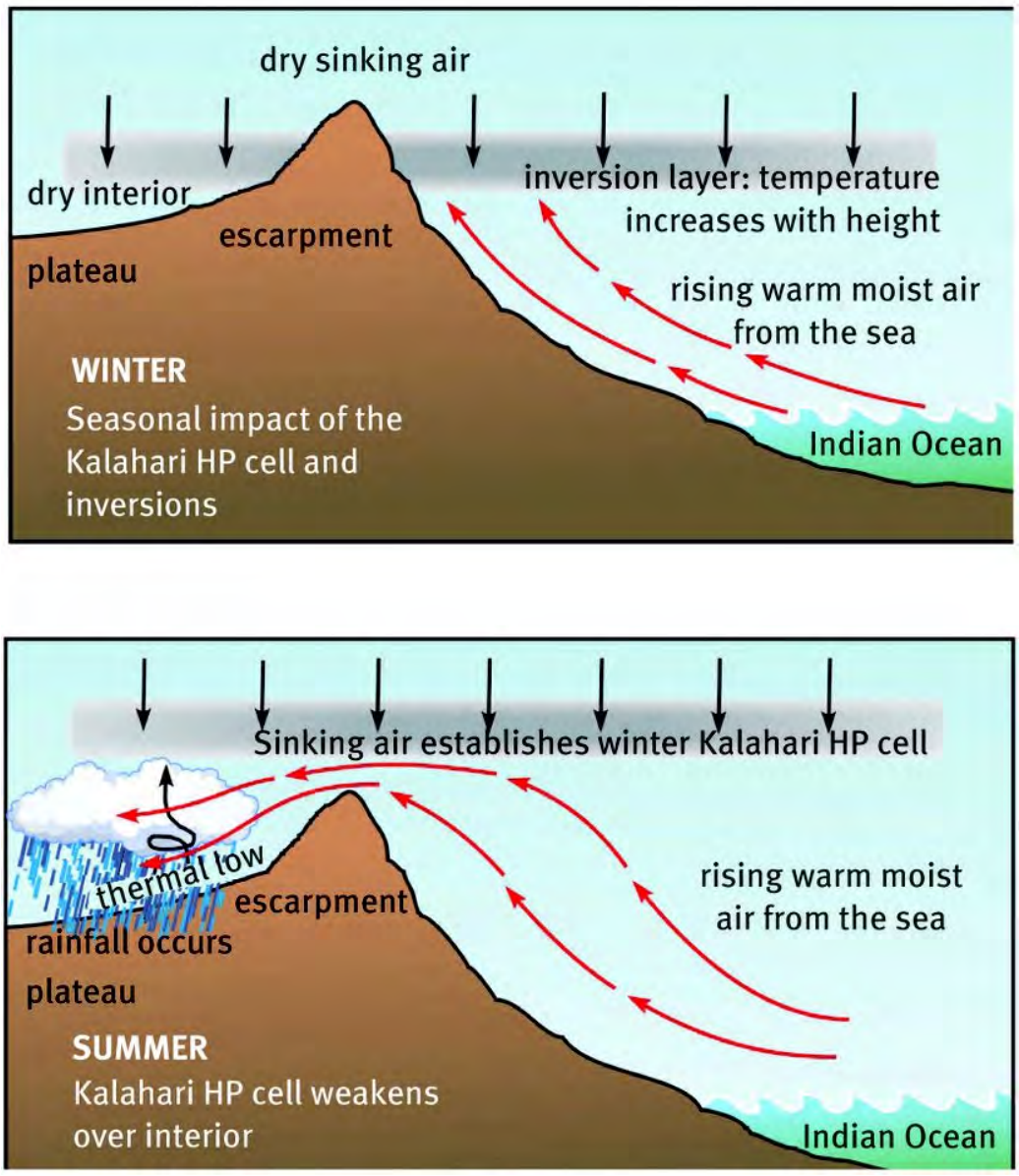


Figure 24 Seasonal impact of the Kalahari high-pressure cell and inversions

4 What are the travelling disturbances associated with anticyclonic air circulation in South Africa?

4.1 Line thunderstorms and moisture fronts

Most thunderstorms over the interior are associated with a moisture front extending from the north-west to the south-east.

4.1.1 How the moisture front develops

Moist, warm, unstable air from the South Indian high comes in from the north-east. Drier, cooler, more stable air comes in from the South Atlantic high from the south-west. The contact zone between these different air masses is known as the moisture front.

The dry, cooler air from the south-west is denser and heavier and it ridges in under the north-east air mass, forcing it to rise and causing cooling and cloud formation in the moist, north-east air mass. Thunderstorms develop in a wide strip north-east of the moisture front or trough axis (Figure 25). Line thunderstorms only develop in summer because of the lifting of the inversion layer in summer.

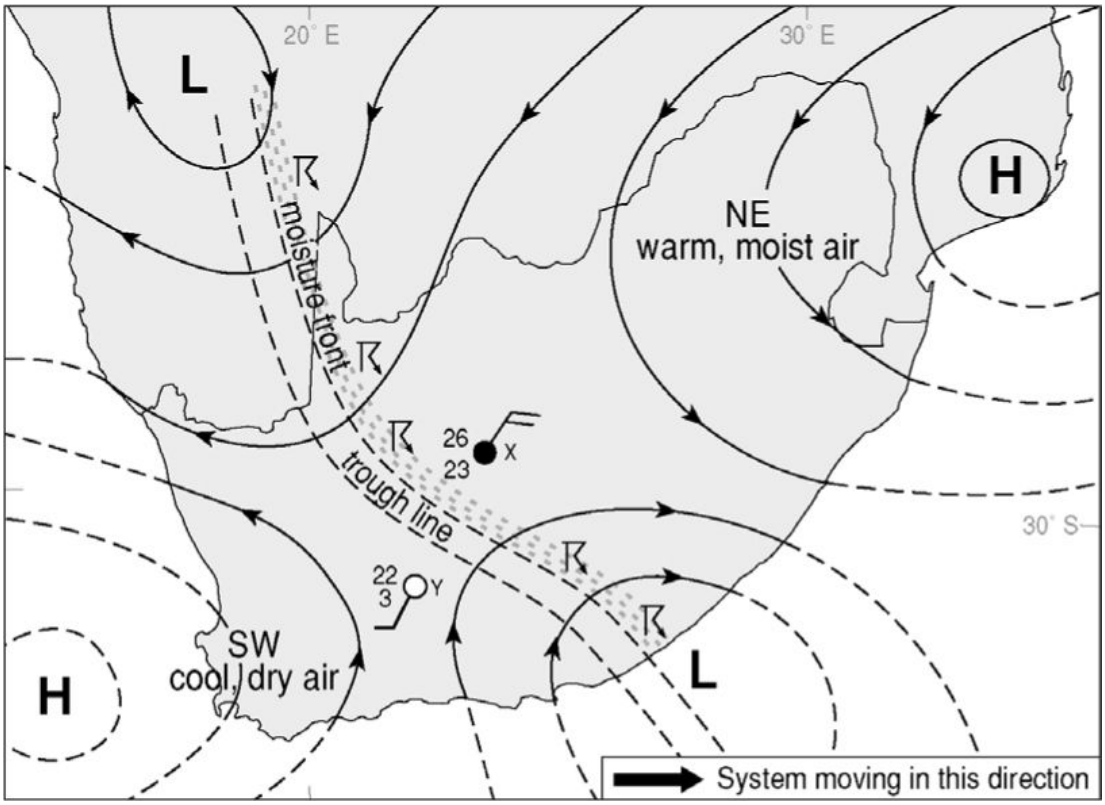


Figure 25 Line thunderstorms develop along the eastern side of the moisture front

4.2 The coastal low

A coastal low-pressure system is a weak low pressure cell, about 100 km wide, in the lower layers of the atmosphere (Figure 25). Coastal lows occur when the wind blows from the land to the sea. This results in warm, often strong, offshore berg winds in front of the low and cool onshore flow behind it.

The clockwise circulation causes an off-shore air flow on the leading side. As this air is heated adiabatically it reaches the coast as a dry, warm (berg) wind. On the non-leading side of the coastal low the air is on-shore and brings cool, cloudy weather.

4.3 Berg winds

Berg winds are warm, dry offshore winds, descending from the high-lying areas and blowing towards the sea. Berg winds occur mainly in winter, but they can also cause very dry and hot days during other seasons. Berg winds can be recognised on synoptic charts by:

- temperatures much higher than the normal for winter especially along the coast
- low humidity – a large depression to the dew point
- winds blow from the interior to the sea.

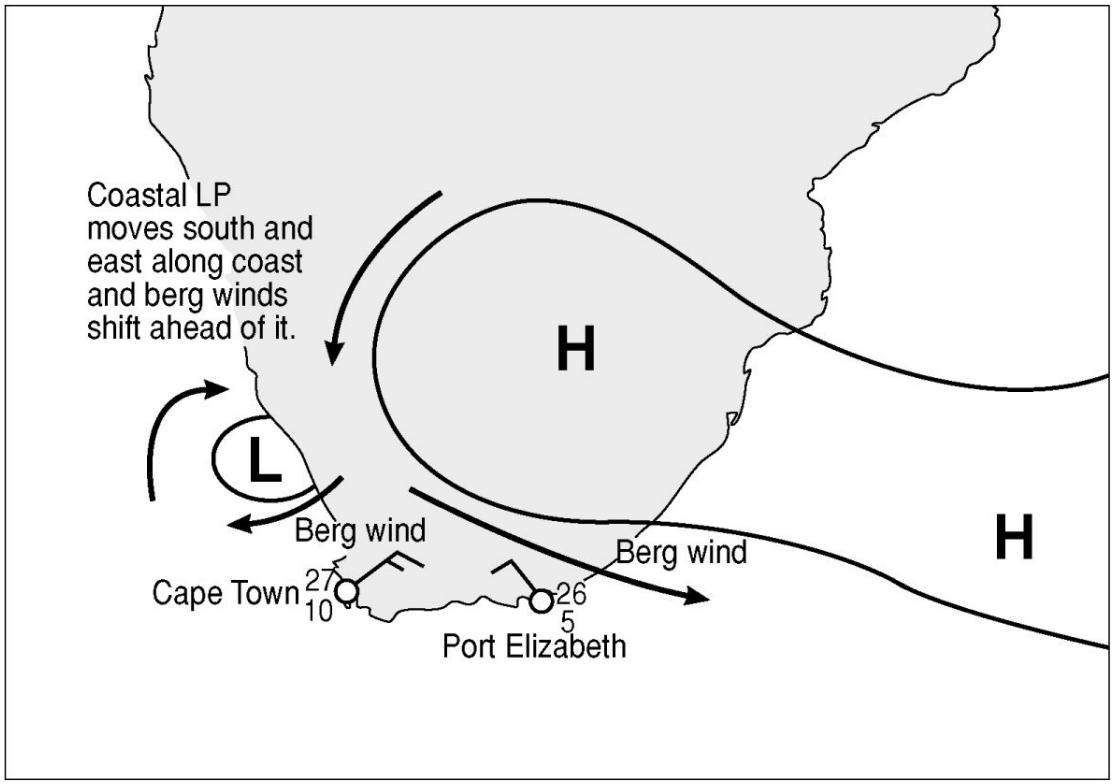


Figure 26 A coastal low and berg wind

5 Synoptic weather maps linked to subtropical anticyclonic conditions

5.1 Summer conditions

- The westerly wind belt and its depressions move south of the continent (Figure 27).
- Temperatures generally are high.
- The South Indian high is situated eastwards and anticlockwise circulation transports moisture on its way to the continent.
- Uplift along the escarpment can cause clouds and precipitation.
- The South Atlantic high is closer to the west coast and brings in dry air.
- A moisture front forms where the different air masses from the Indian and Atlantic Oceans meet (west of the low pressure trough).
- Thunderstorms develop along the moisture front.
- Note the position of tropical cyclone Dando on Figure 27.

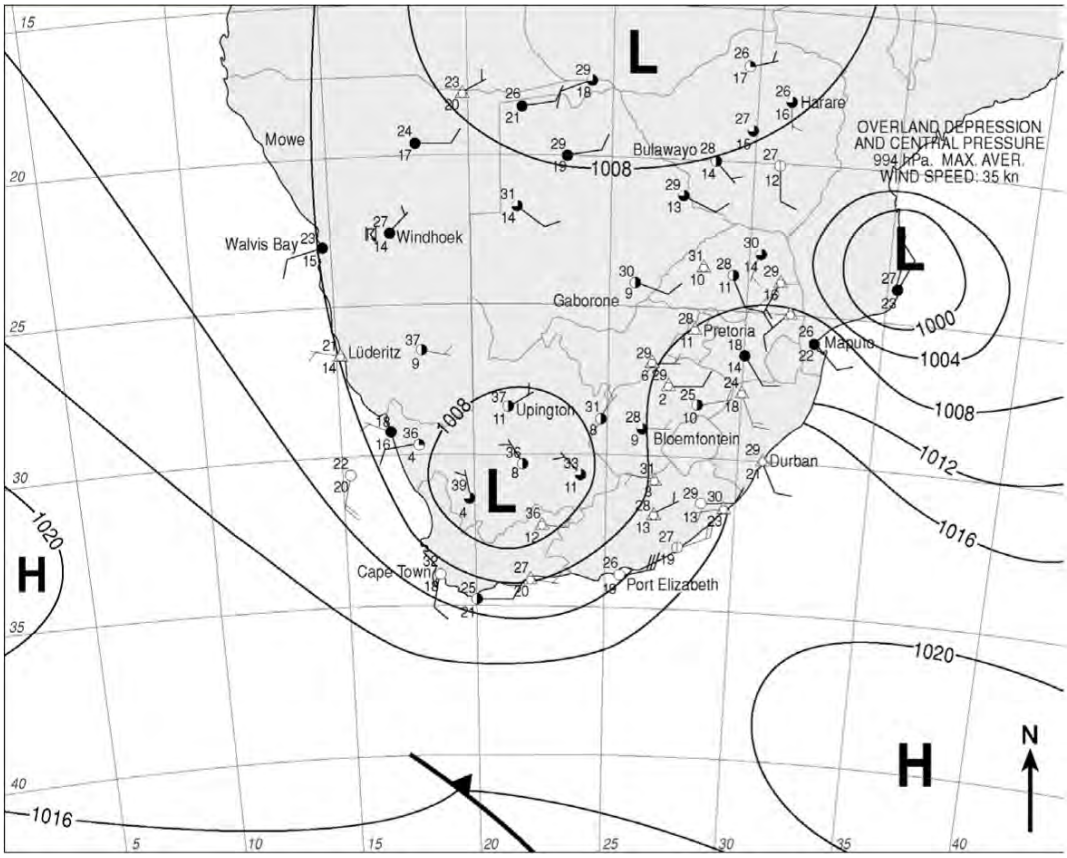


Figure 27 A synoptic map showing summer conditions

5.2 Winter conditions

The synoptic weather map in Figure 28 illustrates weather patterns typical of winter conditions.

- The pressure systems shift northwards.
- The cold fronts are closer to the continent.
- Temperatures are generally lower than summer conditions
- The Kalahari anticyclone is over the interior. This results in dry conditions with little cloud cover.

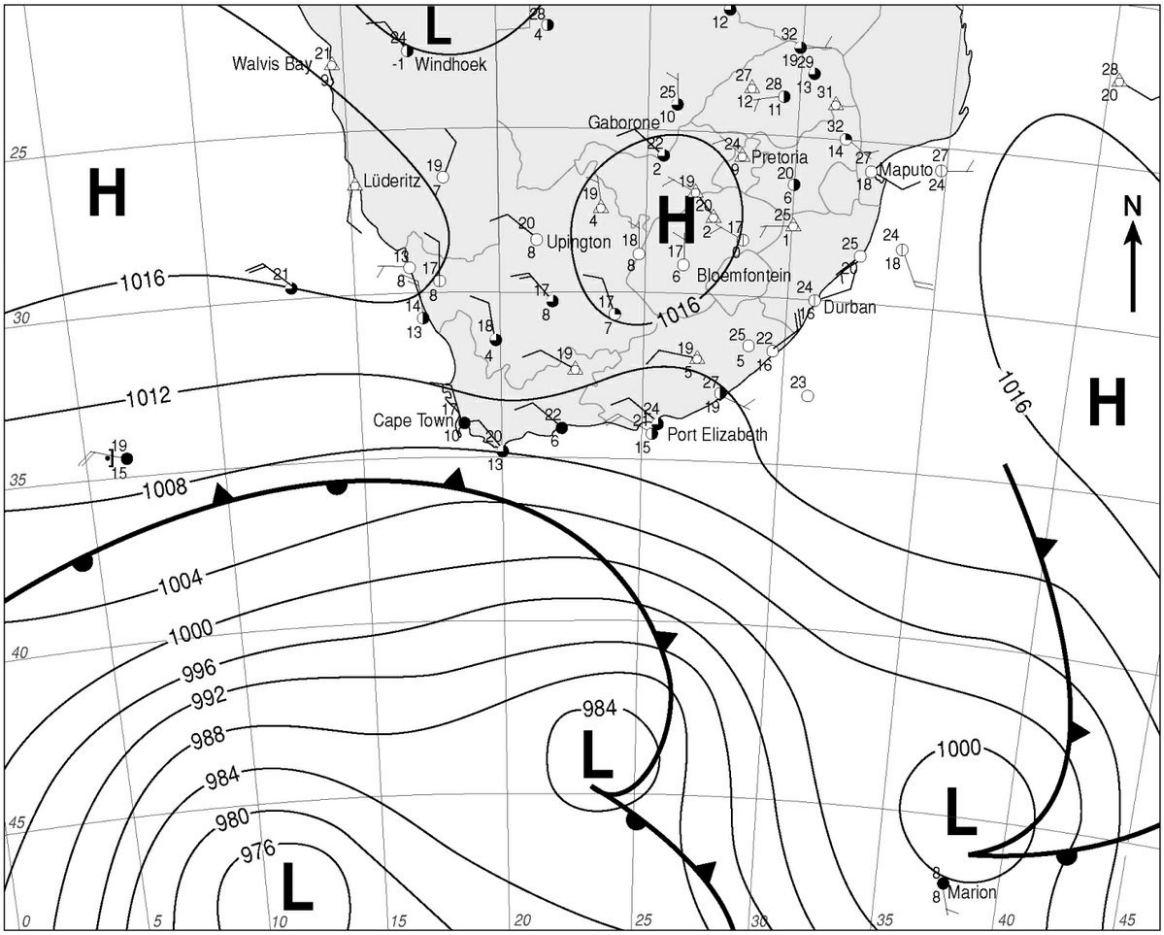


Figure 28 A synoptic map showing winter conditions

6 Reading and interpreting synoptic maps

- Isobars close together show a steep pressure gradient and strong winds. When isobars are far apart there is a gentle pressure gradient with weak winds.
- In the Southern Hemisphere air circulates clockwise round low pressure and anti-clockwise round high pressure.
- Low pressure cells show that air is converging and rising and there is a possibility of rain. High pressure cells show diverging subsiding air and the skies will be clear.
- Onshore winds bring moist air onto the land. Offshore winds are dry.
- The sub-tropical high pressure belt is split into three: the South Atlantic high, the Continental or Kalahari high and the South Indian high.
- These pressure cells are further south in summer and further north in winter. The Kalahari high is usually only seen in winter.
- A trough of low pressure can usually be found over the land in summer. It extends from the north-west (Namibia) to the south east (Eastern Cape).
- Mid-latitude cyclones usually blow over the land in winter but are usually further south in summer and miss the land.
- Sometimes there is a coastal low pressure cell on the coast. It usually moves around the coast from west to east.
- Tropical cyclones are sometimes seen in the Indian Ocean in summer.
- The Western Cape receives its rain in winter while the plateau receives its rain in summer.
- Temperatures over the land in summer will be higher than they are in winter.

Most exams have questions on a synoptic map. You must be able to tell the difference between winter and summer maps (Table 9).

Table 9 The differences between summer and winter synoptic maps

Summer	Winter
• Temperatures in the high 20s and low 30s • Kalahari high seldom seen • Low pressure trough usually over land • Mid-latitude cyclones usually to the south of the land • Sometimes a tropical cyclone in the Indian Ocean • Sometimes rain on the plateau • Seldom rain in Western Cape	• Temperatures in the low 20s and high 10s • Kalahari high often seen • Low pressure trough seldom over land • Mid-latitude cyclones usually over the land • Never a tropical cyclone in the Indian Ocean • Never rain on the plateau • Often rain in Western Cape

Unit 4 Valley climates

1 How is the micro-climate in valleys influenced by the slope?

Micro-climatology deals with the climates of small areas. Aspect refers to the direction a slope faces, and thus to the exposure of the slope to the Sun.

The direction of the valley sides influence the angle at which the Sun's rays strike the Earth's surface. Although an equal amount of sunlight strikes each place, the sunlight striking the north-facing slope is distributed over a small area. On this slope the Sun's rays will be most effective and this slope will be warmer. The effects of aspect are more noticeable in winter when the Sun's rays are at more of an angle. In the Southern Hemisphere the north facing slopes are warmest (Figure 29).

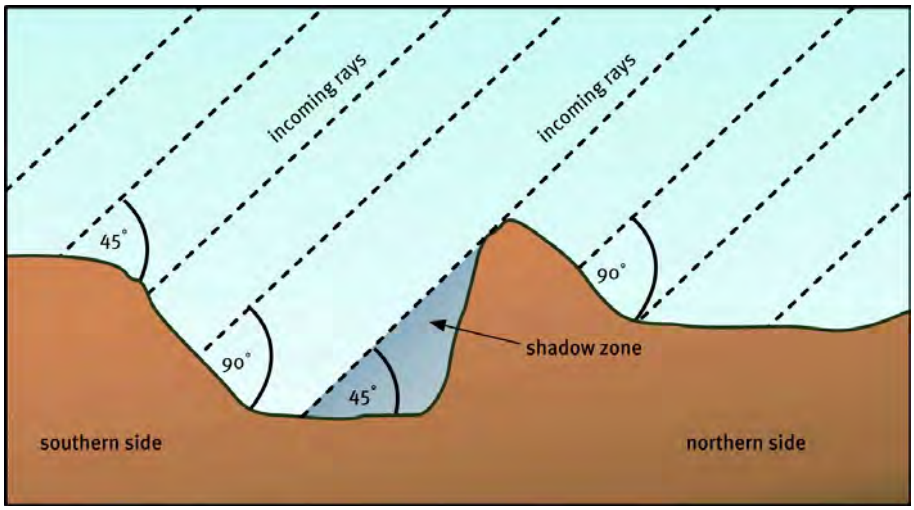


Figure 29 Sun's rays falling on a valley in winter in the Southern Hemisphere

2.1 The effects of aspect on human activities.

Because in the Southern Hemisphere south-facing slopes are cooler there is less evapotranspiration. In the Natal Midlands the south-facing slopes are often wooded while the warmer north-facing ones consist of grass. In South Africa traditional communities prefer the warmer north-facing slopes of the escarpment rather than the valley floors and the south-facing slopes. In cities north-facing slopes are more popular for residential areas. In Europe agricultural activities are usually confined to the warmer south-facing slopes.

3 What weather phenomena are associated with the micro-climate in valleys?

3.1 Anabatic and katabatic winds

Valleys produce their own winds due to unequal heating of the valley slopes during the day (Figures 30 and 31).

3.1.1 During the day

- In the morning, air above the valley slopes heats up more than air on the valley floor. Warm air rises towards crests, causing up-slope winds.
- Later in the day, with more heating, air from the valley floor becomes less dense and rises, causing an up-valley anabatic wind.

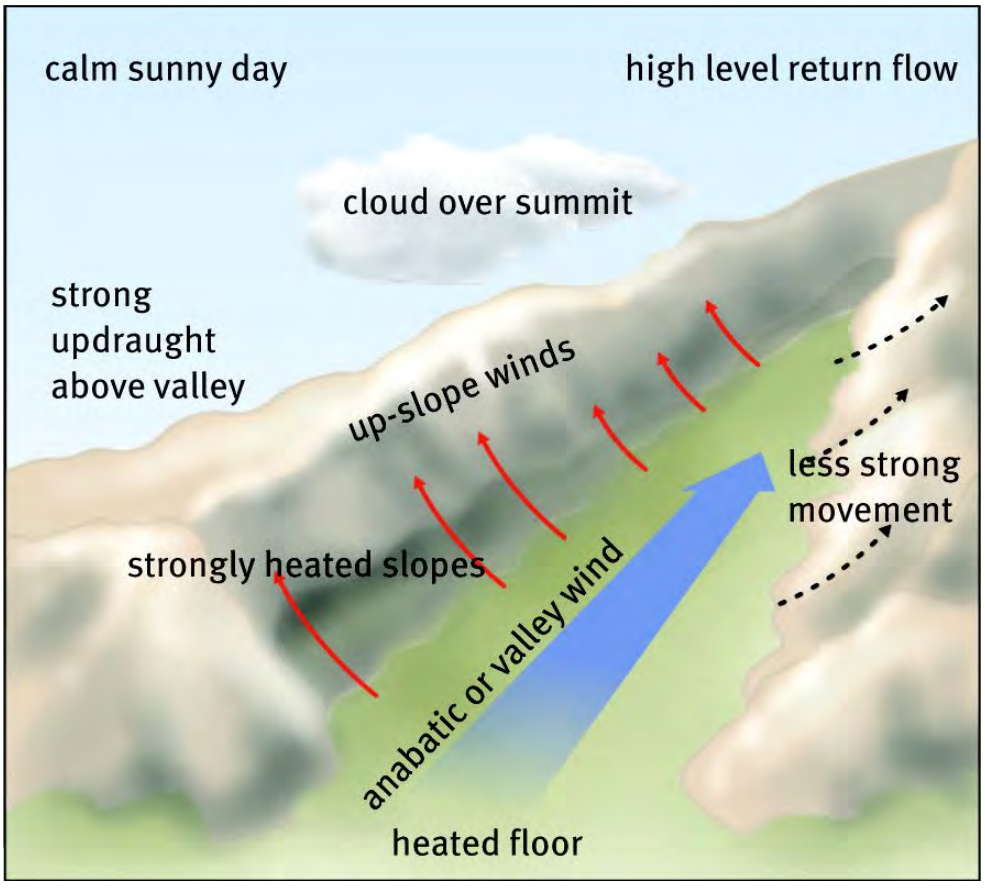


Figure 30 Anabatic or valley wind

3.1.2 During the night

- As a result of terrestrial radiation, air on the high slope sides cools, becomes denser and flows down the valley sides to form a down-slope wind.
- Later in the night, the air in the upper part of the valley cools, become denser and starts to flow down the valley. This causes a down-valley katabatic wind.
- If the down-valley flow is not fast, frost and fog may develop, particularly in hollows.

These winds, although usually gentle, affect the microclimates and human activities. For example, along the slopes in the Franschhoek valley rows of dense hedges are planted to obstruct the downward flow of cold air and keep it away from the vineyards below. During the dry season both anabatic and katabatic winds may become dangerous in the spread of bush and forest fires.

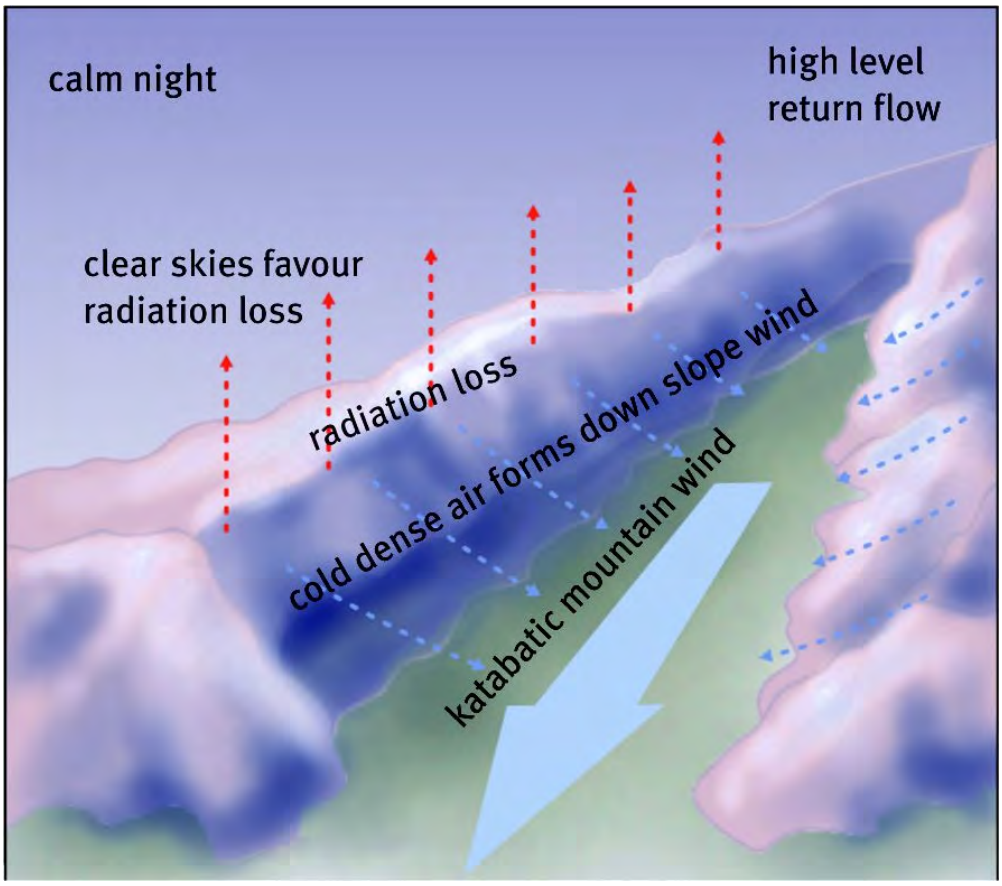


Figure 31 Katabatic or mountain wind

3.2 Inversions and frost pockets

- On calm, clear, winter nights the air on the high ground on the sides of the valley is cooled by terrestrial radiation (night time cooling).
- The cold, more dense air sinks down the valley sides and collects on the floor of the valley, sometimes causing a frost pocket.
- The warm air that was on the valley floor rises onto the middle slopes of the valley, causing a thermal belt of warmer air (Figure 32).

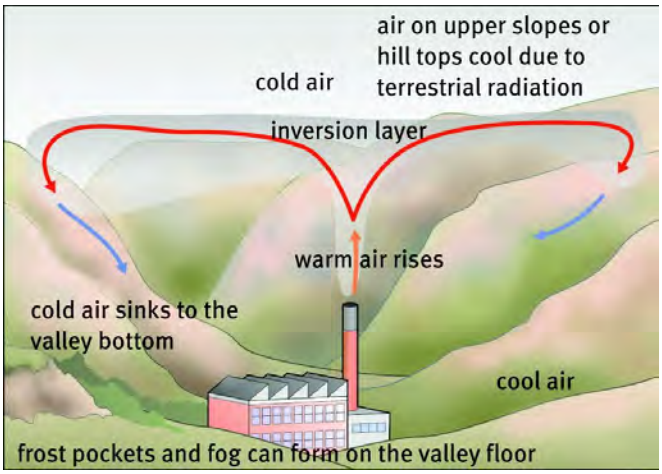


Figure 32 Temperature inversion: emissions are trapped by a layer of warm air in a valley.

3.4 Radiation fog

- Radiation fog, typically found in valleys is formed when nights are cold, clear and cloudless.
- Under such conditions the Earth's surface and the layer of the atmosphere in contact with it cool rapidly.
- If the dew point temperature is reached, condensation occurs and many minute droplets are formed and are suspended in the air.
- Fog on the valley floor disappears rapidly during the course of the morning after isolation starts, when the Earth radiates heat into the atmosphere.

3.5 Utilisation of valley floors

- Valley floors are often popular sites, because of their level topography, agricultural land and the availability of water. Frost hardy plants are grown on valley floors while sensitive plants are grown on the valley sides. Settlements develop in the thermal belt, which is the warmest part of the valley and its sides.
- Nocturnal inversions and katabatic airflow in valleys tend to create pollution in cities as the pollution cannot escape.

4 Urban climates

4.1 What are the differences and the reasons for the differences between rural and urban climates?

Table 10 The urban climate compared to that of rural surroundings		
Local climate in urban areas	**Differences**	**Reasons for these differences**
Annual mean temperature	0,5–4 °C higher	Urban areas consist mainly of artificial surfaces (like bricks, concrete, tar) which absorb more heat. High-rise buildings have larger surface areas, which absorb and retain heat. Fuel combustion in factories and vehicles also contribute to temperature rise.
Winter minimum temperature	1–3 °C higher	
Cloud cover	5–10% more	Condensation can take place only if there are hygroscopic nuclei around which droplets can form. Pollutants like smoke and dust serve as condensation surfaces. Smog lowers visibility.
Fog in winter	100% more	
Fog in summer	30% more	
Precipitation	5–15% more	More precipitation is likely, because of a higher possibility of condensation and cloud formation. The relatively warmer conditions in winter reduce the possibility of snow fall. Greater instability and strong convection over built-up areas can cause vertical cloud development, resulting in more frequent thunderstorms.
Snow fall	5% less	
Thunderstorm frequency	16% more, especially in summer	
Wind speed	25% lower; greater turbulence	Buildings create a sheltering effect. This causes friction and they act as windbreaks. Buildings create wind channels and turbulent eddies form in streets aligned with high-rise buildings.
Relative humidity	6% less	Lack of sources of moisture like vegetation and water bodies in cities limits evapotranspiration. Surface water is removed quickly by the urban drainage system and does not penetrate the ground.
Dust, pollutant particles	10 times more	Combustion processes, the burning of fossil fuels, traffic and building activities add dust and smoke into the air over a city.
Amount of solar radiation	Up to 30% less	The amount of sunshine reaching the surface is reduced due to the increased amounts of pollutants and clouds over cities.

4.2 What is an urban heat island?

- A heat island is the hotter area of a city surrounded by the cooler urban fringe and rural areas (Figure 33).
- The higher urban temperatures cause an urban heat island to develop over the city. This heat island reaches its greatest intensity above the city centre and diminishes towards the suburbs. Within this heat island the air is less dense and begins to rise. Cooler air from the suburbs moves in to replace this.
- Urban heat islands exist throughout the year, but their effect is more pronounced at night and in winter when temperatures are lower. This is also the situation when there is an anticyclonic subsidence of air, which often happens in southern Africa in winter.

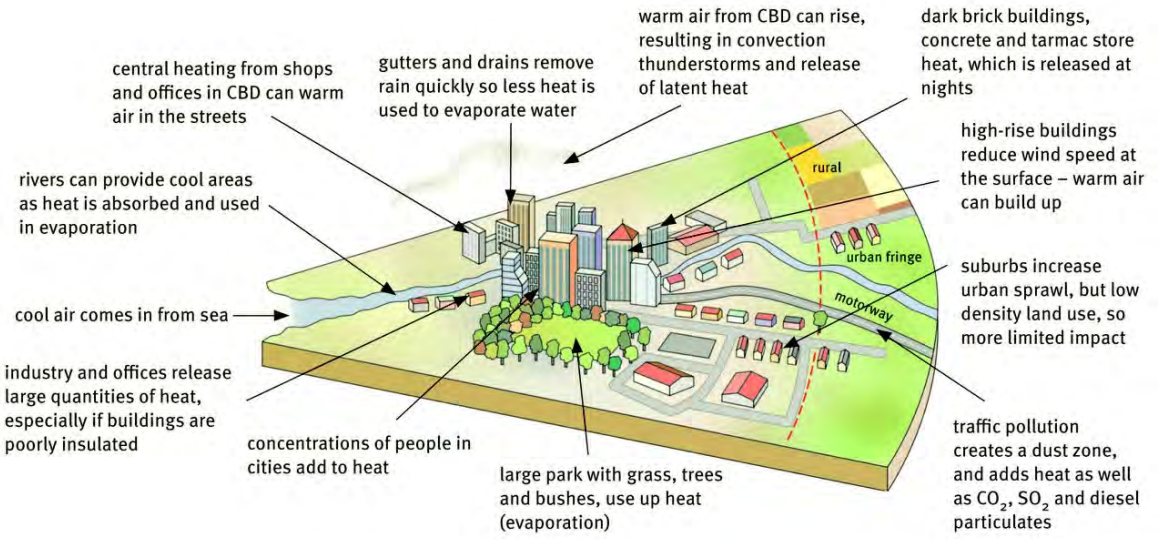
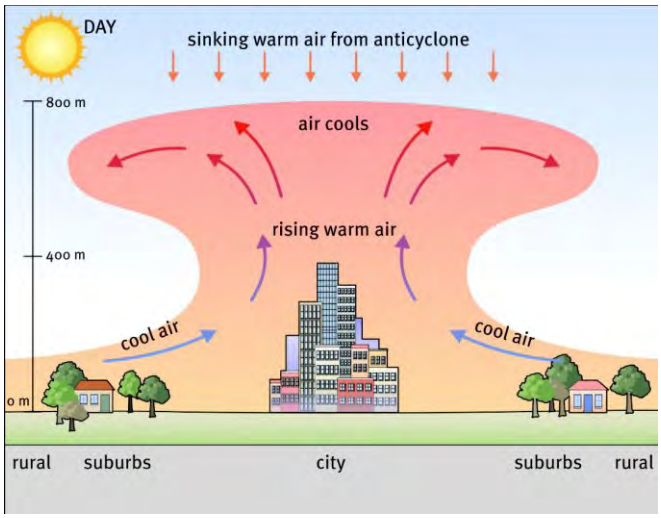
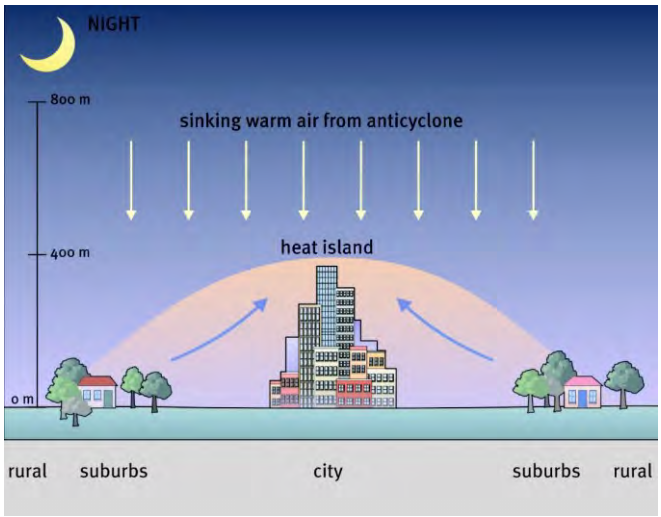


Figure 33 Factors influencing urban heat islands

4. 2.1 What effects do urban heat islands have?

- Increase human discomfort especially in summer.
- Cause heat stress and deaths during heat waves.
- Increase conditions suitable for the spread of disease caused by insects such as mosquitoes and fleas.
- Reduce visibility due to smog, particularly in winter.
- Increase smog.
- Increase air conditioner use leading to release of more heat and greenhouse gases, which degrade local air quality.
- Increase biological activity, for example, growing season length, which is positive.
- Reduce ice and snow in winter, which is positive.

Table 11 The urban heat island during the day and night		
	Features	**Vertical dimension**
Day	• Heating results in increased turbulence, thus a relative decrease in stability of the lower atmosphere. • Heat island grows vertically and therefore is less concentrated. • Pollution is dispersed over a greater area.	
Night	• As it is cooler at night the height decreases and is more concentrated. • The 'heat bubble' is now denser and shallower and takes on a dome shape due to the cooling of the air. • Pollution is concentrated in the dome.	

4.3 What is a pollution dome?

A pollution dome is a mass of polluted air in and above a city or industrial area. This air is prevented from rising by the presence of an inversion above it. If there is a wind, the pollution will be carried downwind to form a pollution plume.

4.3.1 What are the effect of a pollution dome on people and the environment?

Urban pollution has both seasonal and long-term effects on humans and the environment.

- Lead poisoning may result from petrol fumes and old paint peeling off buildings.
- Respiratory discomfort and asthmatic attacks may increase due to smoke emissions.
- The pollutants tend to increase cloud cover and precipitation.
- Insolation is reduced by pollution, especially in the morning when the Sun's oblique rays have to penetrate an even thicker layer of pollution.
- The pollutants cause smog, which contributes to higher temperatures, reduces visibility and is harmful to humans and plant life.
- The release of oil and coal combustion emissions in the air forms acid rain. This pollutes rivers and lakes, causes damage to buildings and kills plants and fish.
- Increased use of fossil fuel powered plants also increases emissions of greenhouse gases, such as carbon dioxide (CO_2), which contribute to global climate change.

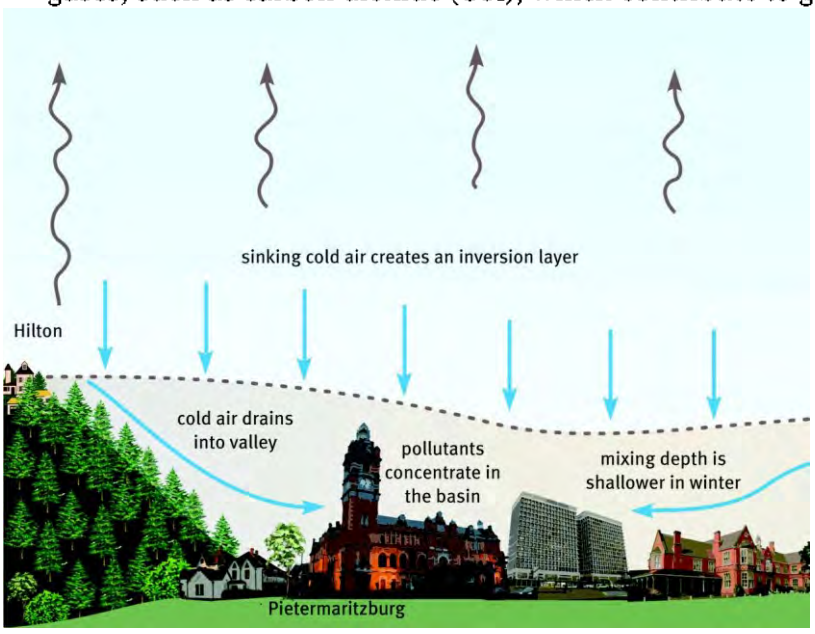


Figure 34 The formation of air pollution on a winter's morning in Pietermaritzburg

4.4 How can the heat island effect be reduced?

The reduction of the urban heat island effect depends on a number of factors. Some of them are within and some outside of a community's control. Climatic conditions and the relief cannot be changed. Decision makers can select energy-saving strategies that will create a healthier and more sustainable environment. Creating urban green spaces like parks and roof gardens, appropriate building design and public transport, can all contribute to reducing urban heat islands.

Questions

Question 1

Match the definitions in the left hand column with the key concepts in the right hand column. You should try to do Question 1 as a closed-book test. If this is difficult you could do it as an open-book test (using the glossary at the back of the Via Afrika Geography Grade 12 Learner's Book) and then do it again as a closed-book test. A knowledge of these concepts is vital for success in the final examination. You should keep working at it until you can do it correctly.

1.1	Surface of contact between two air masses of different temperatures	A	30° S
1.2	Name in Japan for tropical cyclones	B	Advection
1.3	Another name for a high pressure cell	C	Air mass
1.4	Climatic conditions on a local scale	D	Anabatic
1.5	Gravity or mountain winds	E	Anticlockwise
1.6	Causes mid-latitude cyclones to move from west to east	F	Anticyclone
1.7	Urban area of higher temperatures surrounded by rural area of lower temperatures	G	Aspect
1.8	Vertical movement of air	H	Backing
1.9	Horizontal movement of air	I	Berg wind
1.10	Surface of contact between the cold polar air and the warm westerlies	J	Berg winds
1.11	Another name for a low pressure cell	K	Clockwise
1.12	Second stage in the formation of tropical cyclones	L	Coastal low
1.13	An elongated low pressure cell	M	Cold front
1.14	Direction of movement around a high pressure cell in the southern hemisphere	N	Condensation nuclei
1.15	Climatic conditions on a regional scale	O	Convection
1.16	Refers to the direction in which a slope faces in relation to the Sun's rays	P	Cumulonimbus
1.17	Causes tropical cyclones to move from east to west	Q	Cut off low
1.18	Large body of air which has distinct characteristics in temperature	R	Depression
1.19	Area of calm in the centre of a tropical cyclone	S	Dew
1.20	An elongated high pressure cell	T	Dust dome
1.21	Direction of movement around a low pressure cell in the southern hemisphere	U	Easterlies
1.22	Upslope winds in a valley	V	Eye
1.23	Type of front where warm air overrides cold air	W	Family of depressions

1.24	Cloud type associated with tropical cyclones	X	Front
1.25	Another name for the continental high	Y	Heat island
1.26	Hot, dry winds that are common in winter	Z	Immature
1.27	Term used to describe incoming solar radiation	AA	Insolation
1.28	3-D representation of the heat island.	AB	Inversion
1.29	Type of front where cold air undercuts warm air	AC	Isobar
1.30	Another name for the interior low	AD	Isohyet
1.31	Inland depression that is prevented from moving in a south easterly direction by the ridge of the South Atlantic high	AE	Isotherm
1.32	The area between the cold and warm fronts	AF	Kalahari high
1.33	Average latitudinal position of the South Atlantic / South Indian high.	AG	Katabatic
1.34	Low pressure cell associated with berg winds	AH	Macroclimatology
1.35	Phenomenon whereby a cold front overtakes a warm front	AI	Microclimatology
1.36	A grouping of temperate cyclones	AJ	Occlusion
1.37	The anticlockwise change of direction of a wind	AK	Polar front
1.38	Warm dry wind experienced on the South African coast	AL	Ridge
1.39	Hydroscopic particles, such as dust or grains of salt which may attract water vapour and cause condensation	AM	Storm surge
1.40	Moisture condensed from the air and deposited on grass and other plants especially during the night	AN	Thermal low
1.41	A line joining places on the map having the same temperature	AO	Trough
1.42	A line joining places on the map having the same pressure	AP	Typhoon
1.43	A line joining places on the map having the same rainfall	AQ	Warm front
1.44	The piling up of water against a coast caused by strong on-shore winds	AR	Warm sector
1.45	An increase in temperature with height	AS	Westerlies

45×2=(90)

Question 2

Indicate the best answer to the multiple choice questions below. As with Question 1 try to do it with your books closed. If it is too difficult do it as open-book test and later again, as a closed-book test.

2.1 Extra-tropical cyclones have both cold fronts and warm fronts. What weather is associated with cold fronts as they pass over a point?

A wind veers, decrease in temperature, rise in dew point and there is cloud cover

B wind veers, increase in temperature, pressure increases, rise in dew point and there is cloud cover

C wind backs, rise in dew point temperature, increase in temperature, pressure drops and there is cloud cover

D wind backs, decrease in temperature and pressure drops

2.2 What effect do extra-tropical cyclones have on South African weather?

A rain and cool air onto the Highveld

B rain throughout South Africa

C winter rainfall in the SW Cape and cold air in the interior

D lower coastal temperatures only

2.3 The main difference between tropical and extra-tropical cyclones is that extra-tropical cyclones have fronts. What are fronts?

A warm air found in front of cold air

B the one side of an extra-tropical cyclone

C the beginning of cyclogenesis

D the transition zones that separate the different air masses

2.4 In what season do extra-tropical cyclones usually occur?

A winter in the Southern Hemisphere

B autumn in the Southern Hemisphere

C summer in the Southern Hemisphere

D spring in the Southern Hemisphere

E at all seasons

2.5 Figure 1 shows a graph of weather conditions over a 48 hour period of a tropical cyclone.

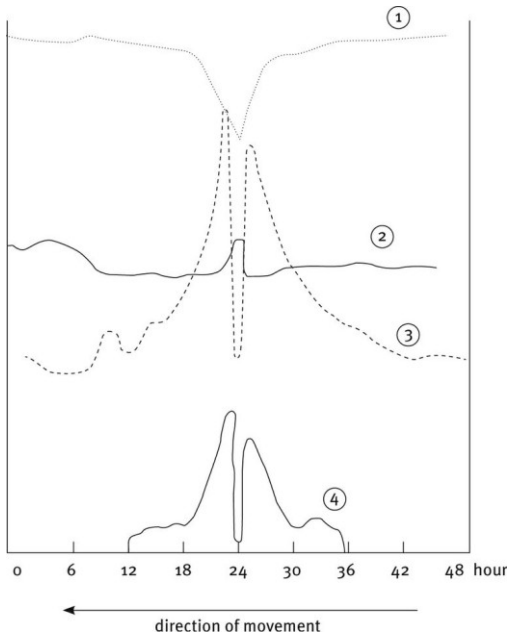


Figure 1

2.5.1 Line 1 on the graph (Figure 1) shows the relationship between time and ...

A wind speed
B dew point temperature
C air temperature
D atmospheric pressure
E rainfall

2.5.2 Line 2 on the graph (Figure 1) shows the relationship between time and ...

A wind speed
B dew point temperature
C air temperature
D atmospheric pressure
E rainfall

2.5.3 Line 3 on the graph (Figure 1) shows the relationship between time and ...

A wind speed
B dew point temperature
C air temperature
D atmospheric pressure
E rainfall

2.5.4 Line 4 on the graph (Figure 1) shows the relationship between time and ...

A wind speed

B dew point temperature

C air temperature

D atmospheric pressure

E rainfall

2.6 If a tropical cyclone does not reach land, what other factors can account for its dissipating?

A decrease in air pressure

B decrease in moisture

C rise in temperature

D increase in air pressure

E both B and D

2.7 How can you identify a tropical cyclone on a synoptic chart?

A warm and cold fronts

B synoptic symbol, closed isobars and high wind speed

C isobars and synoptic symbol

D the existence of a high pressure

E both A and B

2.8 What is the basic pattern of air movement over South Africa?

A South Africa is dominated by the easterlies, the westerlies and tropical cyclones

B South Africa is dominated by extra-tropical cyclones and berg winds

C South Africa is dominated by three shifting high pressure cells and frontal depressions that originate in the westerly wave belt

D South Africa is dominated by the Kalahari cell, thunderstorms and the plateau

E Both A and B

2.9 How does the ocean affect the South African weather?

A leads to extremes of temperature and reduces precipitation

B moderates the temperature and increases the chances of precipitation

C influences the aspect, relief and summer rain

D leads to high rainfall on the east and west coasts

E raises the temperatures on the plateau

2.10 From where does interior of South Africa get most of its rain?

A disturbances along the moisture front
B the Zimbabwe air boundary
C the westerly wave belt
D the Inter Tropical Convergence Zone
E tropical cyclones

2.11 How does the interior plateau affect South Africa's climate?

A increases winter precipitation with height above sea level
B decreases winter precipitation with height above sea level
C increases temperature with height above sea level
D decreases temperature with height above sea level
E both A and D

2.12 The interior of South Africa is dominated by sub-tropical anticylonic circulation. What does this mean?

A the easterlies and the westerlies join together
B there is a high pressure belt within the easterlies
C there are mid-latitude cyclones affecting the Western Cape
D winters are generally dry and sunny
E both C and D

2.13 What causes the westerly wind belt to move north in winter?

A the apparent movement of the rainfall belt
B summer air temperature
C winter air temperature
D ocean currents
E the apparent movement of the overhead sun from the Tropic of Capricorn to the Tropic of Cancer

2.14 An important aspect of climatology is micro-climatology. What is micro-climatology?

A the climate of places with a small range of temperature
B the climate of towns and their surrounding rural areas
C the climate of a small area
D the climate close to the ground
E both A and C

2.15 Why is there a greater frequency of fog and precipitation in cities as compared to the surrounding rural countryside?

A artificial heat sources
B higher population density
C more hygroscopic nuclei
D artificial materials
E both A and D

2.16 What makes up air pollution in the cities?

A combustion, chemical gases and exhaust fumes
B smog and dust particles
C carbon monoxide and lead in petrol
D B and C
E A, B and C

2.17 What is a temperature inversion?

A a dry adiabatic lapse rate in the atmosphere
B when temperature decreases with height in the atmosphere
C a wet adiabatic lapse rate in the atmosphere
D when temperature increases with height in the atmosphere
E both A and C

2.18 Which of the following best describes a heat island?

A cities form a small island of higher temperatures surrounded by cooler temperatures in the rural area
B because of global warming both rural and urban areas are heat islands
C is a city that is, on average, warmer than other world cities
D the area in the city that is hotter by day but colder by night than the rural areas
E an area above a city that has more pollution than the surrounding rural area

2.19 Which is correct about an urban heat island during the day?

A due to general subsidence the horizontal component increases
B due to a decrease in stability and an increase in turbulence the vertical dimension of the heat island decreases
C due to an increase in stability and an decrease in turbulence the vertical dimension of the heat island increases

D due to a decrease in stability and an increase in turbulence the vertical dimension of the heat island increases

E none of these

2.20 What effect does the location of mountain and hill slopes have on a valley climate?

A at lower latitudes slopes facing the equator are coolest

B at higher latitudes slopes facing the equator are warmest

C at the poles the slopes facing the equator are coolest

D at the equator the slopes facing away from the Sun are coolest

E both A and C

2.21 Table 1 below shows temperatures on two consecutive July days at 06:00 on a farm in the Drakensberg.

Table 1

		Temperatures °C	
	Height	First day	Second day
Station X	800 m	-5	-6
Station Y	1 400 m	-1	1

2.21.1 In Table 1 the weather responsible for causing the differences in temperature is likely to occur when ...

A anabatic winds are blowing

B the winter is warm

C there is a cloud barrier at 1 300 m

D a cold front is situated over the area

E the nights are clear and cold

2.21.2 In Table 1 the most likely answer for the lower temperatures at X is ...

A Y has a sunny aspect while X has a north-facing slope

B X has snow while Y has not

C the air at X is drier than that at Y

D during the night there has been rapid terrestrial radiation and cold air has dropped down the valley sides

E B and D

25×2=(50)

Question 3

The Grade 12 final exam, usually, if not always, has questions based on a synoptic map. Make sure you can do this question and it should help you at the end of the year.

3.1 Study Figure 2 showing a Southern African synoptic weather map and answer the questions that follow.

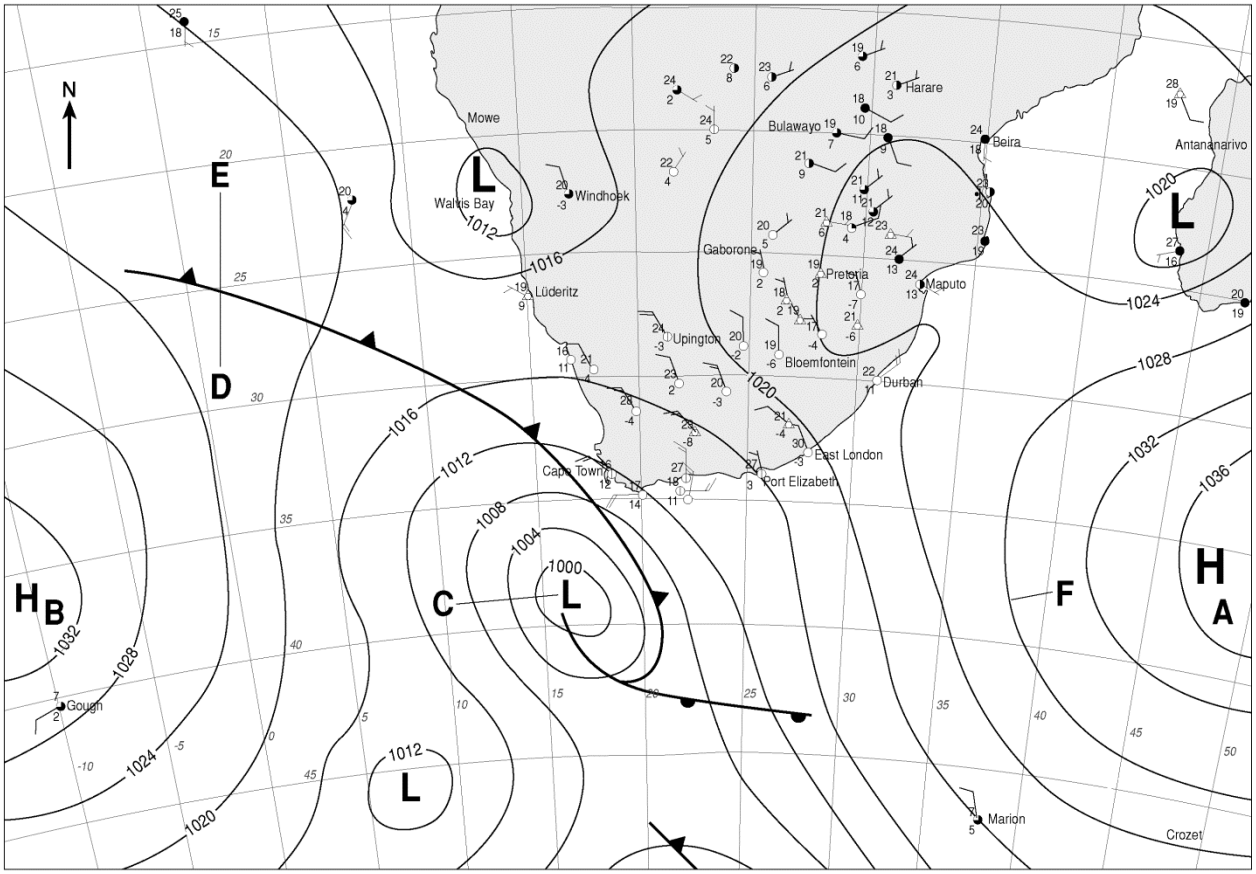


Figure 2

3.1.1 Name each of the high pressure systems A and B. 2×2=(4)

3.1.2 Identify the climatic feature with low pressure at C. (2)

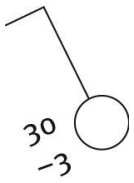
3.1.3 Draw a fully labelled cross-section from D to E showing the sectors and air movement. 5×2=(10)

3.1.4 Name the line marked F and state its pressure in hPa. 2×2=(4)

3.1.5 What season does this synoptic weather map represent? (2)

3.1.6 Give three reasons for your answer based on evidence visible on the synoptic weather map. 3×2=(6)

3.2 Refer to the station model of Port Elizabeth below when answering the questions that follow.



3.2.1 Name the type of wind (not direction) that has resulted in the conditions as indicated by the station model. (2)

3.2.2 Account for the atmospheric conditions being experienced in Port Elizabeth. 4×2=(8)

3.2.3 Describe two measures that can be put in place to reduce the impact of possible veld fires resulting from these conditions. 2×2=(4)

(42)

TOTAL MARKS [182]

Answers to Questions

Question 1

1.1 Front ✓✓
1.2 Typhoon ✓✓
1.3 Anticyclone ✓✓
1.4 Microclimatology ✓✓
1.5 Katabatic ✓✓
1.6 Westerlies ✓✓
1.7 Heat Island ✓✓
1.8 Convection ✓✓
1.9 Advection ✓✓
1.10 Polar front ✓✓
1.11 Depression ✓✓
1.12 Immature ✓✓
1.13 Trough ✓✓
1.14 Anticlockwise ✓✓
1.15 Macroclimatology ✓✓
1.16 Aspect ✓✓
1.17 Easterlies ✓✓
1.18 Air mass ✓✓
1.19 Eye ✓✓
1.20 Ridge ✓✓
1.21 Clockwise ✓✓
1.22 Anabatic ✓✓
1.23 Warm front ✓✓
1.24 Cumulonimbus ✓✓
1.25 Kalahari high ✓✓
1.26 Berg winds ✓✓
1.27 Insolation ✓✓
1.28 Pollution dome ✓✓
1.29 Cold front ✓✓
1.30 Thermal low ✓✓
1.31 Cut off low ✓✓
1.32 Warm sector ✓✓
1.33 30° S ✓✓
1.34 Coastal low ✓✓
1.35 Occlusion ✓✓
1.36 Family of depressions ✓✓
1.37 Backing ✓✓
1.38 Berg wind ✓✓
1.39 Condensation nuclei ✓✓
1.40 Dew ✓✓

1.41 Isotherm ✓✓
1.42 Isobar ✓✓
1.43 Isohyet ✓✓
1.44 Storm surge ✓✓
1.45 Inversion ✓✓

45×2=(90)

Question 2

2.1 D ✓✓
2.2 C ✓✓
2.3 D ✓✓
2.4 E ✓✓
2.5.1 D ✓✓
2.5.2 C ✓✓
2.5.3 A ✓✓
2.5.4 E ✓✓
2.6 E ✓✓
2.7 B ✓✓
2.8 C ✓✓
2.9 B ✓✓
2.10 A ✓✓
2.11 D ✓✓
2.12 D ✓✓
2.13 E ✓✓
2.14 C ✓✓
2.15 C ✓✓
2.16 E ✓✓
2.17 D ✓✓
2.18 A ✓✓
2.19 D ✓✓
2.20 B ✓✓
2.21.1 E ✓✓
2.21.2 D ✓✓

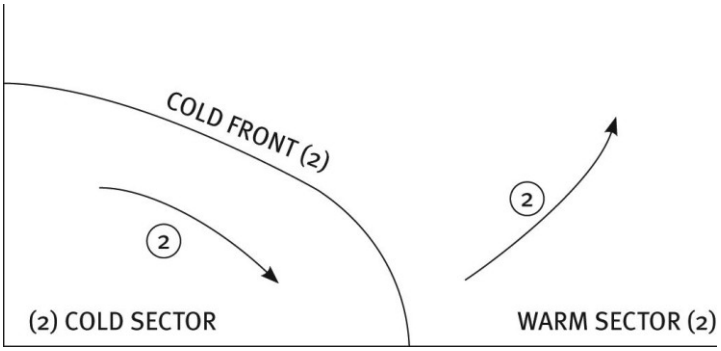
25×2=(50)

Question 3

3.1.1 A – South Indian high ✓✓
B – South Atlantic high ✓✓ (4)

3.1.2 Extra-tropical cyclone or mid-latitude cyclone, or depression or frontal depression ✓✓ (2)

3.1.3



5×2=(10)

3.1.4 F is an isobar. ✓✓ The pressure is 1 028 hPa. ✓✓ 2×2=(4)

3.1.5 Winter ✓✓ (2)

3.1.6 Three of: Mid-latitude cyclone passing over South Africa, ✓✓ dry or cloudless interior, ✓✓ high pressure over the land, ✓✓ low temperatures in 10s and low 20s, ✓✓ HP systems further north ✓✓ Any 3×2=(6)

3.2.1 Berg wind ✓✓ (2)

3.2.2 Hot, 30 °C due to adiabatic heating as air descends the escarpment from KH to the coastal LP, ✓✓ dry (dew point temperature -3 °C) as the air has come from the interior Kalahari or Continental high, ✓✓ gentle wind from the interior as the pressure gradient is low, ✓✓ absence of cloud due to dry conditions ✓✓

4×2=(8)

3.2.3 Two valid points: Burn fire breaks, ✓✓ place emergency services on standby (fire bombers, fire tankers), ✓✓staff the fire towers, ✓✓ use media to create awareness ✓✓ 4×2=(8)

(42)

TOTAL MARKS [182]

Topic 2 Geomorphology

Unit 1 Drainage systems in South Africa

Running water on the surface of the Earth is the most dominant agent of change in the physical landscape. The study of the relief features shaped by running water, for instance mountains, hills, floodplains, valleys and waterfalls is known as fluvial geomorphology. A fluvial geomorphologist studies everything in connection with rivers, from the pebbles in the river bed to the velocity of the water flow, to determine the condition of the river.

1 What are the characteristics of drainage basins?

The drainage basin acts as a system with inputs, flow, storage and outputs. Water and sediment move through the system. A drainage basin is the total area of land surface drained by a stream network (Figure 35).

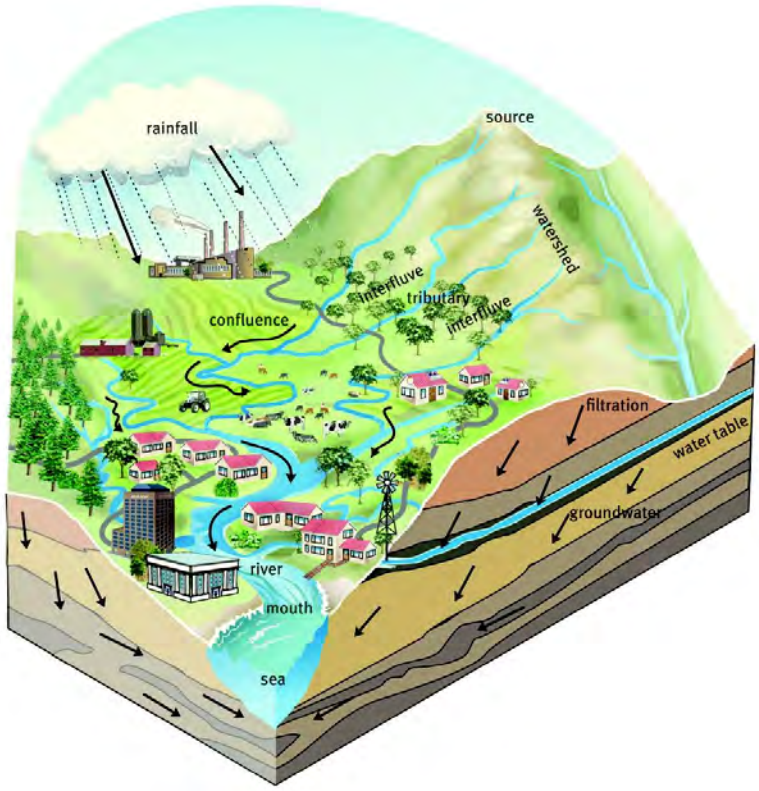


Figure 35 Components of a drainage basin

1.1 Features of a drainage basin

The main features of drainage basins are illustrated in Figure 35 and defined in Table 12.

Table 12 The main features of drainage basins	
catchment area	The area over which rain falls that is caught by a drainage basin
river system	A main river with all its tributaries
watershed	An area of high ground separating two drainage basins
tributary	A river that joins another larger river
river mouth	Sea or lake where the river ends
source	Where the river begins
confluence	The place where two rivers join
water table	The upper level of underground saturated rock
surface run-off	The surface flow of water
groundwater	Water found under the ground
interfluve	High lying area or spurs between two river valleys
infiltration	Movement of water through soil into the ground

2 What are the different types of rivers?

Permanent rivers flow all year round and are always in contact with the water table. The Tugela River is an example.

Periodic rivers only flow during the rainy season. They are in contact with the water table only in the rainy season. The Limpopo River is a South African example.

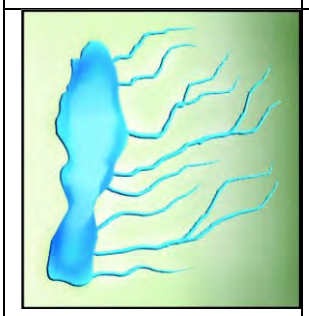
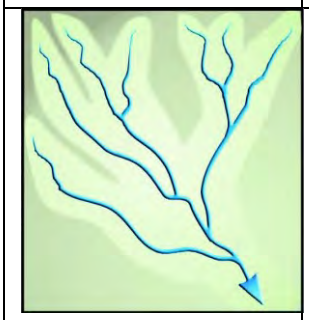
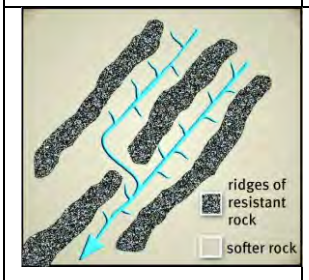
Episodic rivers only flow after heavy rain. These rivers are found in regions where there is low rainfall, which evaporates quickly. The Auob and Nossob Rivers of the Kalahari in Northern Cape are examples.

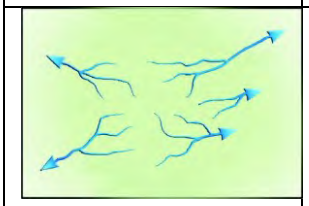
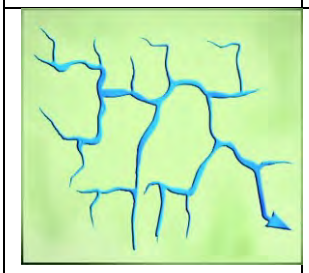
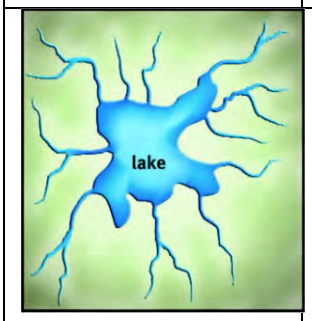
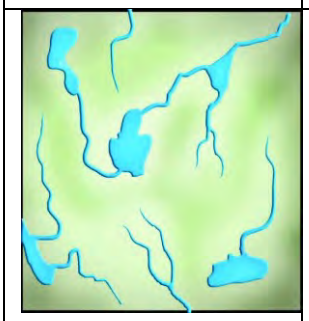
Exotic rivers span two types of climatic regions. These rivers usually rise in high rainfall areas and flow into dry regions The Orange River (or Gariep) rises on the eastern side of South Africa, and flows through the drier western side before it reaches the Atlantic Ocean.

3 What are drainage patterns?

Stream channels create a variety of drainage patterns on the surface of the Earth. By studying the stream patterns of an area, one can learn much about underlying structures and rock types (Table 13).

Table 13 Drainage patterns

Parallel drainage pattern			
	Requirements	**Characteristics**	**Example**
	• Recently uplifted sloping plain • Rock type uniformly resistant to erosion	• The main streams flow parallel (or nearly) to each other. • The tributaries enter the main streams at very small angles.	Tributaries of the Steelport River in Limpopo
Dendritic drainage pattern			
	Requirements	**Characteristics**	**Example**
	• Rock is uniformly resistant to erosion. • Pattern is not dependent on geology.	• The pattern is tree-shaped. • The tributaries join the main stream at acute angles.	Most rivers in South Africa, for example Tugela, Mooi, Umgeni
Trellis drainage pattern			
View	**Requirements**	**Characteristics**	**Example**
	• Parallel ranges of fold mountains or alternate layers of hard and soft rock. • A strong main stream • The pattern is dependent on the relief and the geology of the area.	• Tributaries meet the main streams at right angles. • The main streams cut gaps through the mountains.	Buffels River at Laingsburg

Radial drainage pattern			
View	**Requirements**	**Characteristics**	**Example**
	• Dome-shaped hill, conical hill, mesa, butte	• Streams radiate outwards from a central high point.	Koffiebus, Teebus
Rectangular drainage pattern			
View	**Requirements**	**Characteristics**	**Example**
	• Well jointed rock with joints exposed at the surface	• Rivers flow in exposed joints. • Rivers and tributaries have right angled bends.	Rivers in the Waterberg (Limpopo)
Centripetal drainage pattern			
View	**Requirements**	**Characteristics**	**Example**
	• A central basin or a low lying area such as a lake or a marsh	• Streams radiate inwards from a surrounding higher area. • The opposite of a radial drainage pattern	Common in the flatter parts of Namaqualand
Deranged drainage pattern			
View	**Requirements**	**Characteristics**	**Example**
	• Geologically young areas	• Haphazard pattern • Numerous lakes and swamps • Streams enter and leave swamps and lakes randomly.	Recently glaciated areas such as the Canadian Shield

4 What is drainage density?

Drainage density refers to the average length of the streams in the area of a drainage basin. Drainage density can be calculated by making use of the following formula:

$$\text{Drainage density} = \frac{\text{total length of streams in the basin (km)}}{\text{area of the drainage basin (km}^2\text{)}}$$

Drainage density can be described as high and low (Figure 36).

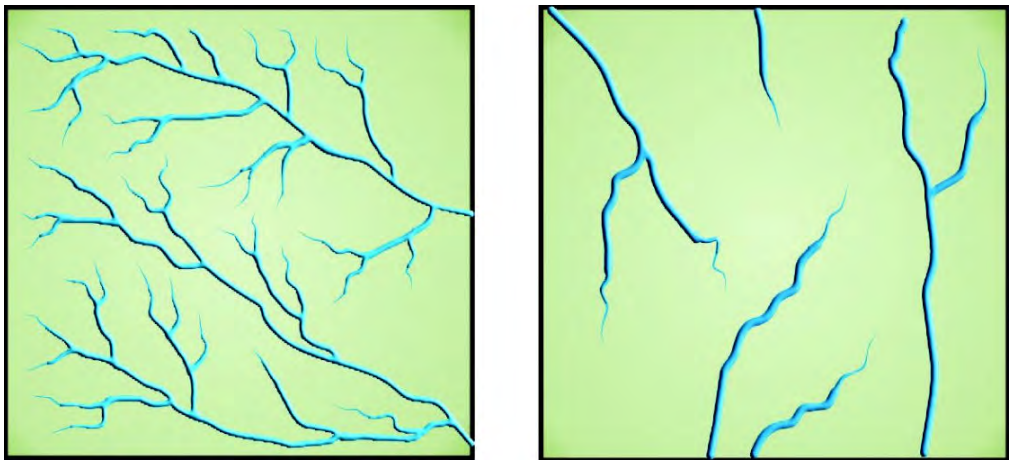


Figure 36 Equivalent areas with high drainage density (left) and low drainage density (right)

- More infiltration will cause fewer rivers to occur, causing a low drainage density.
- More runoff will cause more rivers to occur, causing a high drainage density.

5 How do you identify stream order?

Drainage basins can be described and compared by means of a ranking system known as stream order. Streams without tributaries are first order streams. When two first order streams join they result in a second order stream and when two second order streams they form a third order stream and so on. When a stream of a lower order joins a stream of a higher order the higher one remains unchanged. This arithmetic process is known as geo-adding.

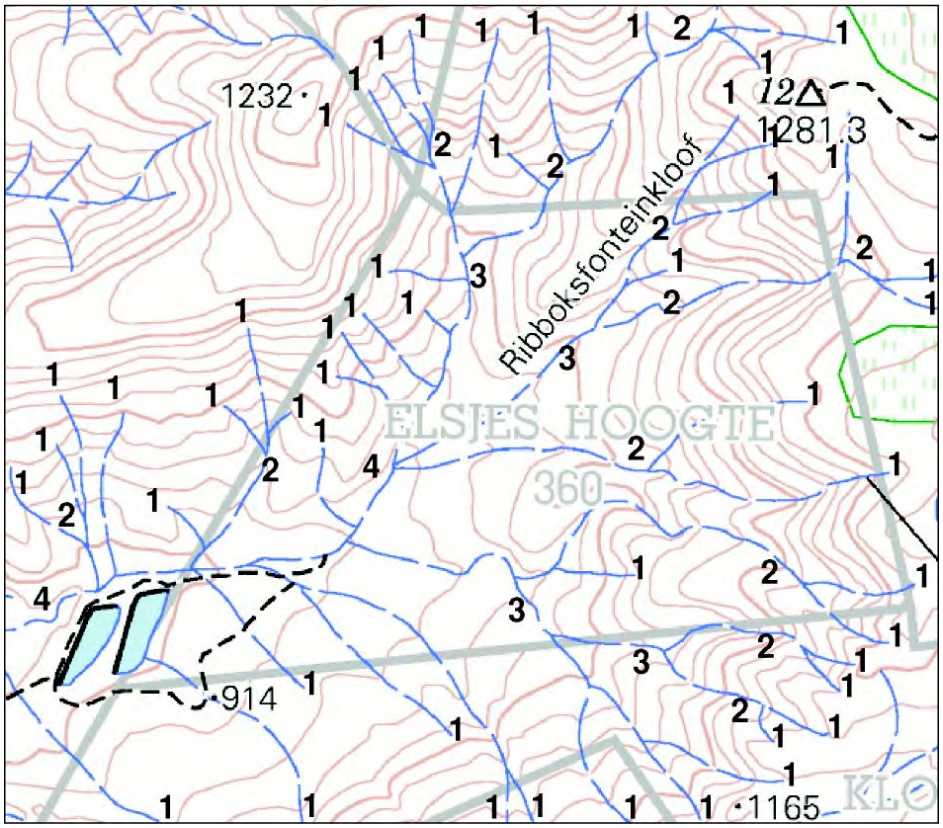


Figure 37 Topographic map with the stream order indicated by numbers

The following laws of stream orders show the relationship between stream order and factors such as gradient, number of streams, stream length and the size of the drainage basin.

- There are more streams of a lower order than of higher order.
- The lower the stream order, the steeper the gradient.
- The lower the stream order, the shorter the length of the stream.
- The lower the stream order, the smaller the drainage basin.

6 What is the nature of river discharge?

River discharge is the volume of water that flows down a river. The stream flow can be either laminar or turbulent.

- Laminar flow is found where water flows over a level and even river bed. The water moves as parallel sheets (Figure 38).
- Turbulent flow occurs where the river bed is uneven and steep. The water moves in a bubbling, turbulent manner, continually changing levels (Figure 39).

Figure 38 Laminar flow

Figure 39 Turbulent flow

Unit 2 Fluvial processes

1 What are river profiles?

A river uses energy to do its 'work' of erosion, transportation and deposition of sediment, and to move a body of water in its channel from its origin to its mouth. In this way, the river valley is continually deepened and widened. River profiles are described as either transverse (cross) profiles or longitudinal profiles.

1.1 What is a transverse river profile?

The transverse profile shows the shape of the river valley from one bank of the river to the opposite bank. The shape is dependent on whether vertical erosion or lateral (sideways) erosion is the dominant force. The cross profile of a river looks like a V-shape. The shape of the cross profile changes throughout the course of the river (Figure 40). It can help you to see if erosion (vertical or lateral) or deposition is taking place.

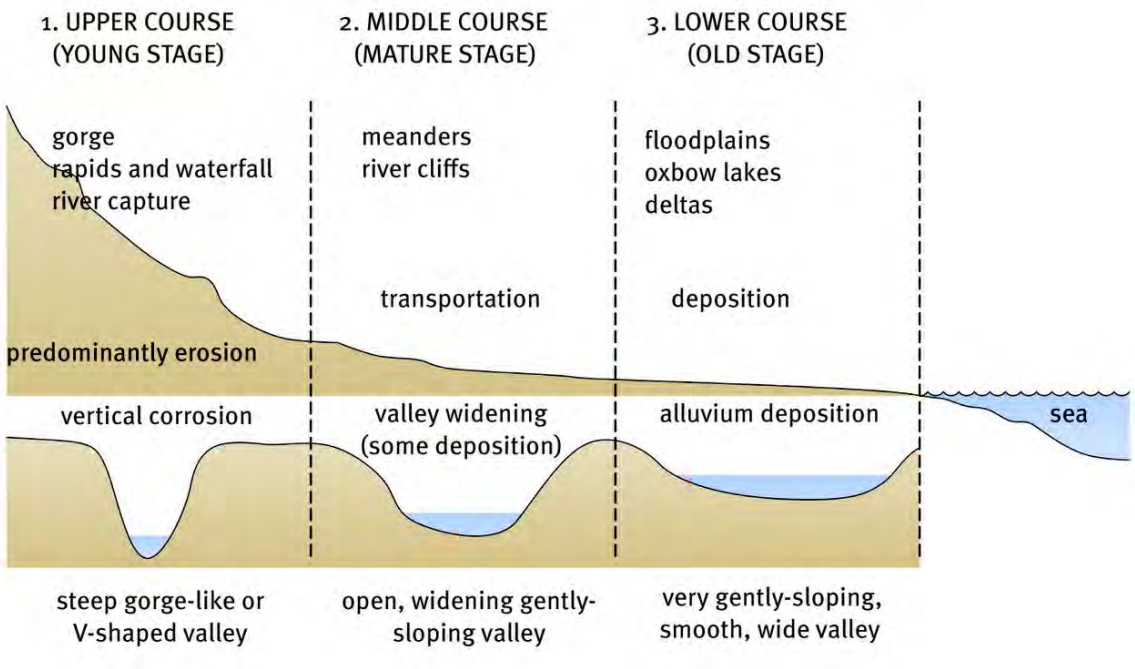


Figure 40 The transverse profile of a river in its upper, middle and lower courses

1.2 What is the longitudinal profile?

The longitudinal profile shows the changes in the altitude of a river's course from source, along its channel to sea level. Usually the longitudinal profile has a concave shape. It will have a steep gradient at the source and a gentle gradient at the mouth (Figure 40).

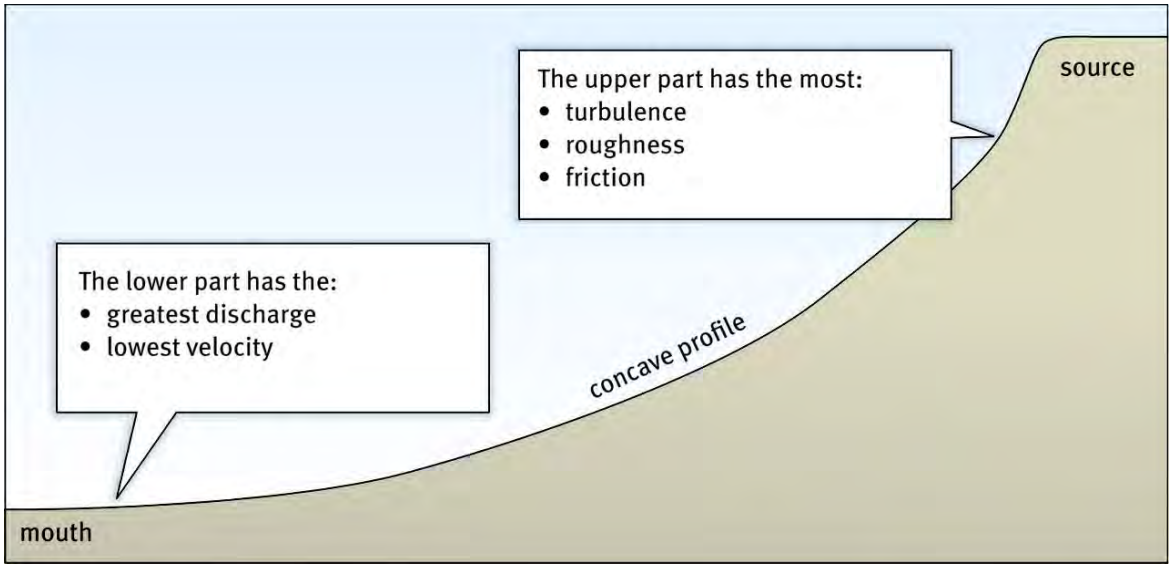


Figure 41 The longitudinal profile of a river and associated landforms

1.2.1 Temporary and permanent base levels in the longitudinal profile of a river

The lowest level at which a river can erode is called the permanent base level. Sea level is called the permanent base level because the river cannot erode downwards any further. Temporary base levels such as a dam, rapids or a waterfall could be found along the course of a river. All base levels are temporary, except the sea, which is the ultimate base level (Figure 41).

1.2.2 The stages of a river seen on topographic maps

Figure 42 shows the features of the three stages of the Berg River in the Western Cape on topographic maps. In the upper course (Figure 41) the contours are closer to each other, indicating steep slopes and short tributaries. In the middle course, the contours are further apart. The gradient becomes more gradual and tributaries are longer. The slope in the lower course is very gradual. Therefore deposition of sand, meanders and braided streams are found in this course. The river becomes wider as it flows from its source to the mouth.

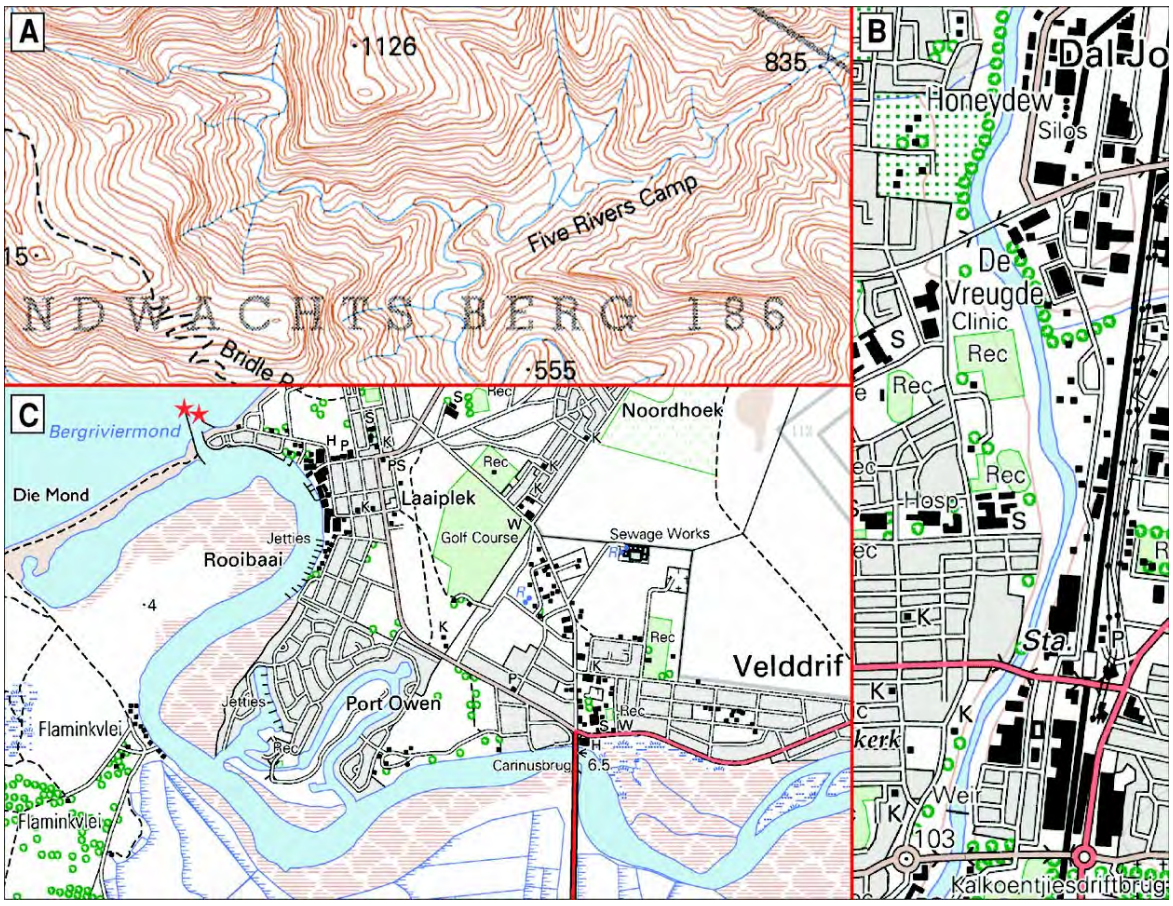


Figure 42 Three stages of the Berg river in the Western Cape

2 What are fluvial landforms?

The greater the velocity of a river, the greater the amount of energy will be available to transport material and cause erosion. Deposition of sediment takes place when the speed of the river reduces and the energy of a stream decreases. As a result, different landforms are formed, along the course of a river.

2.1 Floodplains

Floodplains are natural features of many rivers. They are flat and are on the sides of the river. Floodplains are usually found in the lower course of a river where the valley is widened by means of lateral erosion but smaller flood plains can also be seen in the middle course. When the river bursts its banks in a flood sediment is deposited on either side of the river (Figure 43). This builds up after each flood. Typical landforms of a floodplain are natural levées, meanders, oxbow lakes, braided streams and deltas.

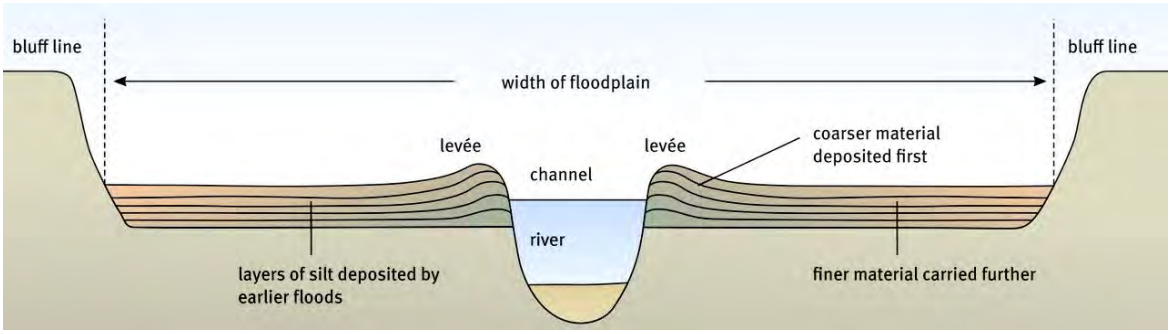


Figure 43 Cross section of a floodplain

2.2 Natural levées

During periods of overbank flooding, the coarsest material will be deposited first and this can form a natural embankment, called a natural levee, next to the river (Figure 43). Levées can be strengthened artificially to act as flood barriers.

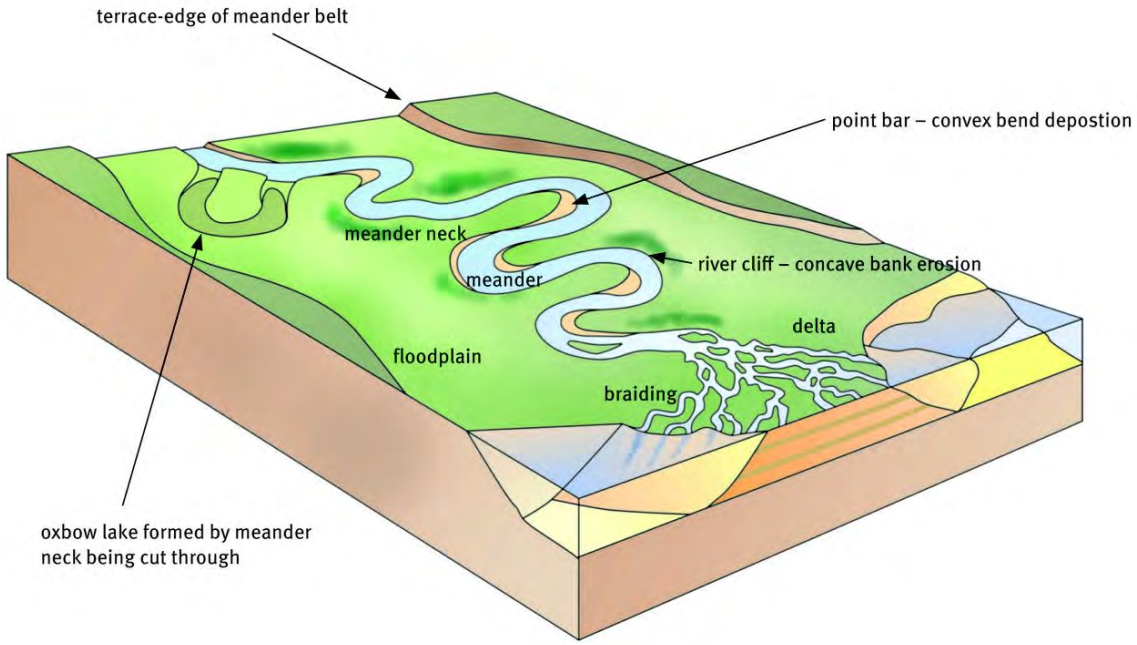


Figure 44 Typical landforms on a floodplain

2.3 Meanders

Meanders are curves or bends found along the course of a river (Figures 44 and 45). They are usually found in the middle course or lower course of a river, and constantly change their shape and position. Meanders move across the floodplain by eroding the curved outside banks (Figure 45).

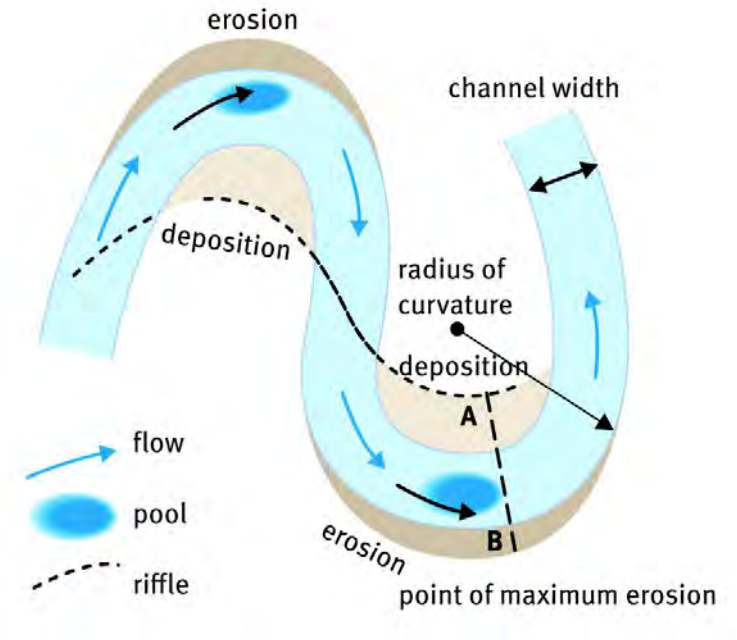


Figure 45 Meanders move laterally by erosion and deposition

2.4 Oxbow lakes

As erosion continues on the outside bends (undercut slopes) of the meander, the neck of the meander gets narrower. During a flood, the river breaks through the neck and shortens its course. The cut ends of the meander are sealed by deposition and a oxbow lake is formed (Figure 46). The oxbow lake may eventually dry up due to evaporation, and be filled with sediment.

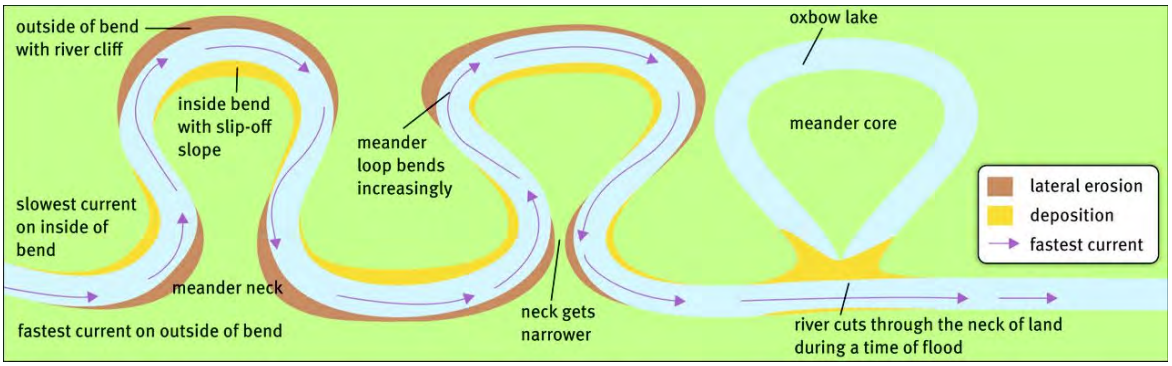


Figure 46 The formation of an oxbow lake

2.5 Braided streams

Braided streams are streams that have many channels and islands of sediment between those channels (Figure 47). When a river does not have the energy to carry its load the load is deposited in the river bed.

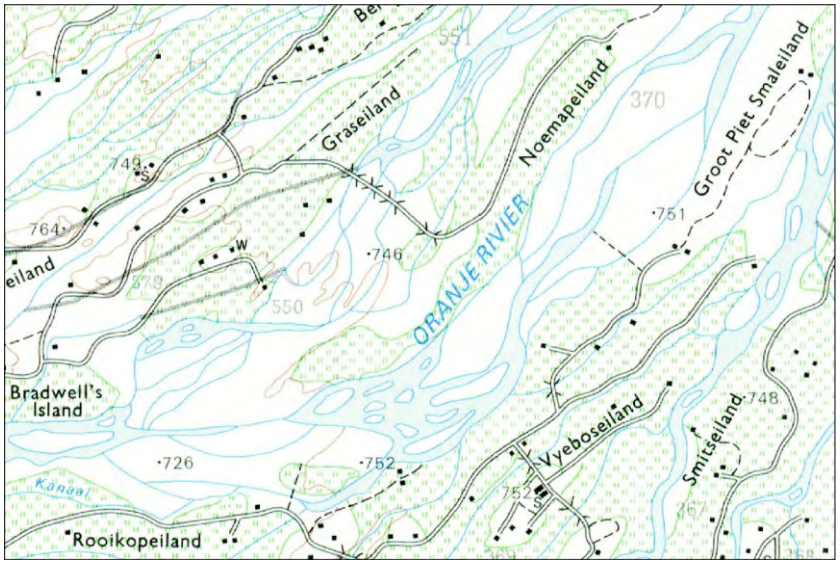


Figure 47Topographic map of Kanoneiland showing braided streams and intervening islands

2.6 Waterfalls and rapids

Waterfalls and rapids are usually found in the steeper upper course of a river. A waterfall forms when a river, after flowing over hard, resistant rock, meets a band of softer, less resistant rock. The river erodes the softer rock faster than the harder rock (Figure 48). Rapids are smaller scale versions of waterfalls.

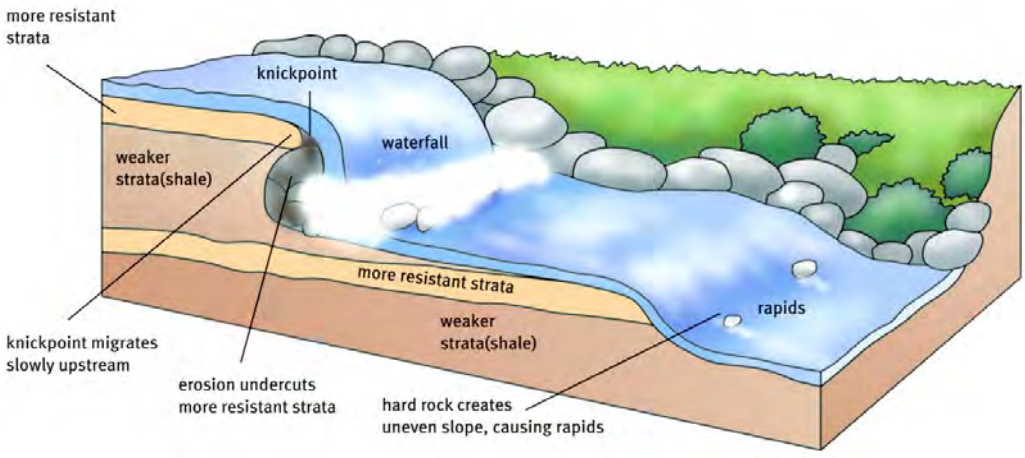


Figure 48 The formation of waterfalls and rapids through erosion

2.7 Deltas

When a river reaches the sea or a lake it slows down, loses energy and deposits its load. If the load of sediment cannot be carried away by tides and ocean currents a delta is formed. Layer upon layer is deposited until the sand and mud may build upwards and outwards to form a roughly triangular delta. No South African river forms a visible delta as the tides and currents remove the sediment before it can settle.

3 What is river grading?

A graded river is in a state of equilibrium and neither erodes nor deposits. A graded river has a gently sloping, concave profile.

The river illustrated in Figure 49A has an ungraded profile, because it contains a waterfall and a lake. These are temporary bases of erosion. Erosion will exceed deposition at the waterfall, and deposition will exceed erosion at the lake.

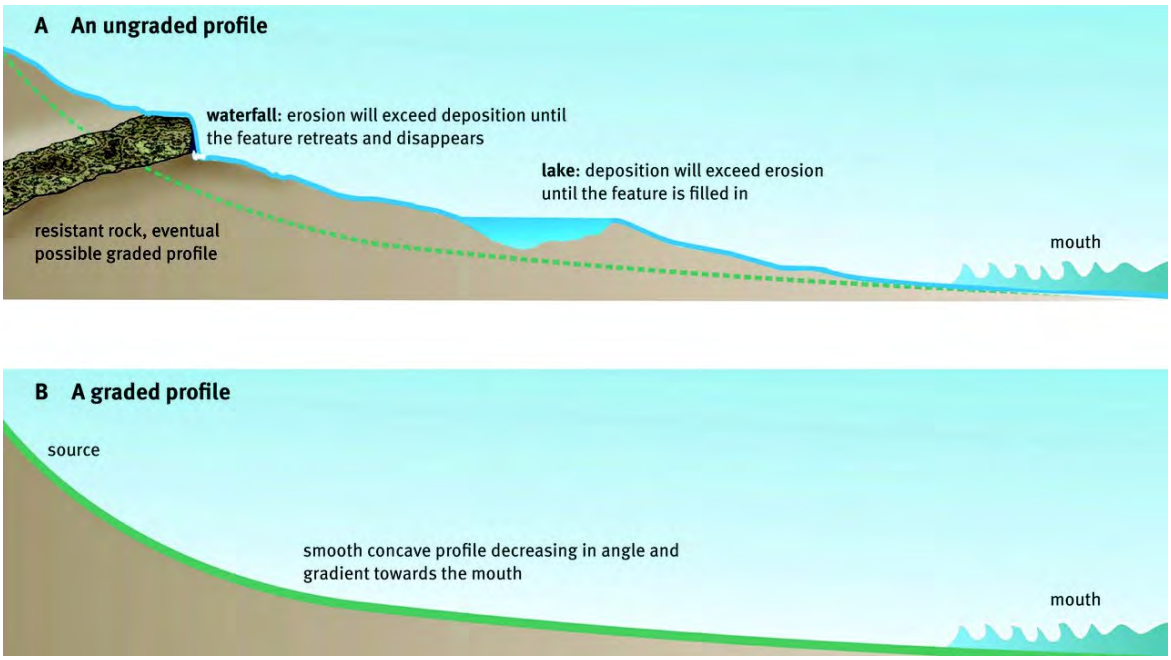


Figure 49 Comparison of a river with an ungraded profile (A) and a graded profile (B)

4 What is river rejuvenation?

River rejuvenation takes place when there is an increase of a river's speed and erosive power. The rejuvenated river erodes a new valley in the old one (Figure 50).

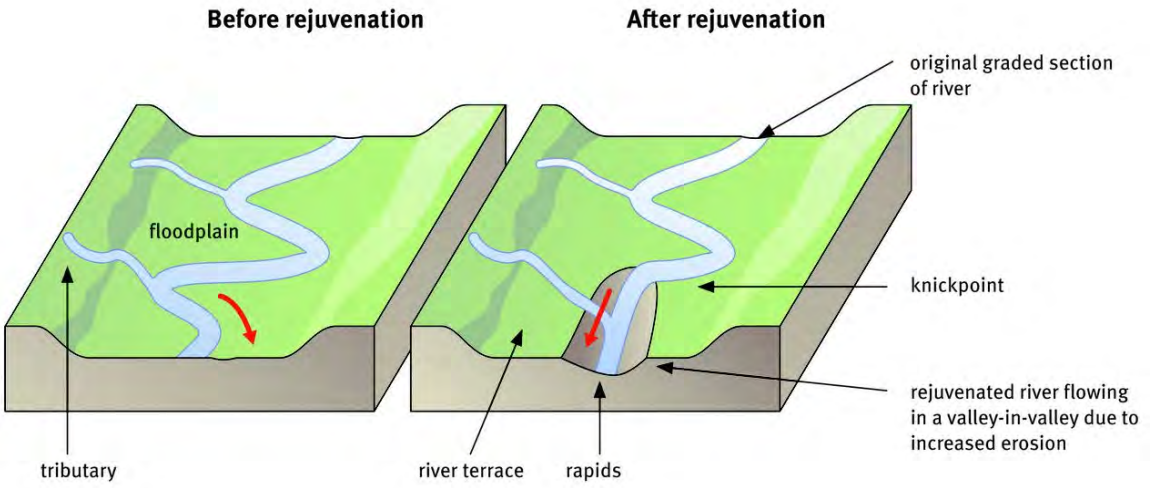


Figure 50 River rejuvenation

4.1 Causes of rejuvenation

River rejuvenation may develop as a result of:

- a worldwide lowering of sea level
- raising of the land through forces in the Earth's crust
- a significant increase in rainfall
- a rapidly flowing tributary that joins the main stream
- river capture where the increased volume of water enlarges the erosion capacity of the stream.

4.2 Landforms associated with rejuvenation

4.2.1 Knickpoint

A knickpoint is a break in the slope of a river profile caused by a rejuvenated river. There is often a waterfall, called the knickpoint waterfall, at this point. Augrabies Falls on the Orange River (Gariep) is a knickpoint waterfall.

4.2.2 Terraces

When rejuvenation of a river flowing on a wide valley floor occurs, a new valley is carved into its own floodplain. This produces steps on either side of the valley. These are terraces, and they often occur in pairs on either side of the valley (Figure 51).

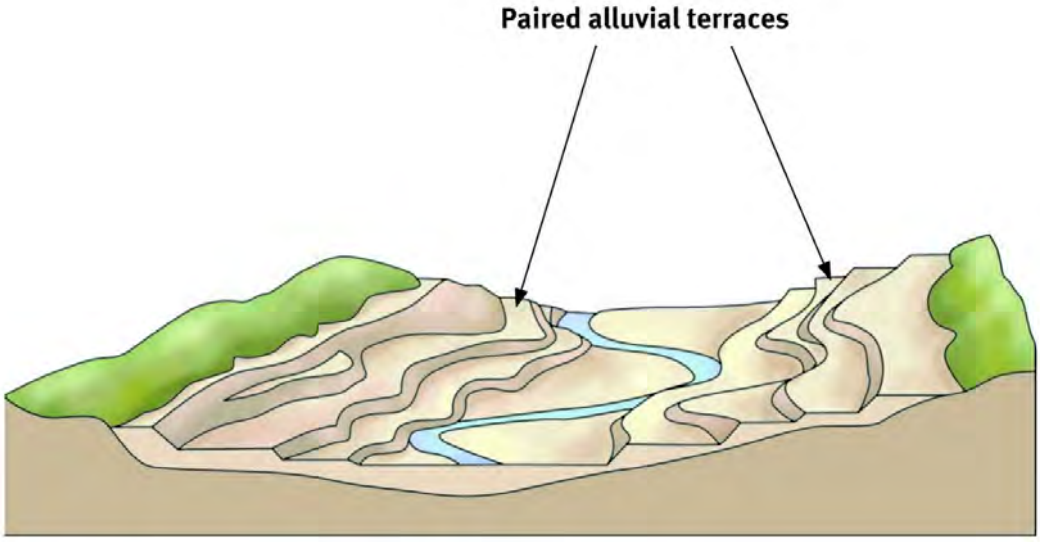


Figure 51 Paired alluvial terraces

4.2.3 Incised meanders

An incised meander is a deep, steep-sided meander (bend) formed by the severe downwards erosion of an existing meander. Such erosion is usually brought about by the rejuvenation of a river. Incised meanders form when rejuvenation occurs in a stream which is already meandering.

5 What is river capture or stream piracy?

River capture (stream piracy) occurs when a powerful river cuts back at its source by headward erosion and captures the headwaters of a neighbouring river. This often occurs through a process of abstraction.

5.1 Abstraction

Abstraction occurs when the stream on one side of the watershed is a more energetic stream than the stream on the other side, because it runs down a steeper slope. More rapid erosion of the steeper slope causes the watershed to move (Figure 52).

In South Africa abstraction occurs mainly in the Drakensberg, where the rivers of KwaZulu-Natal flow eastwards down a steep gradient over a distance of 200 km to the Indian Ocean. The westward flowing Orange River flows along a more gentle gradient over approximately 2 000 km to the Atlantic Ocean.

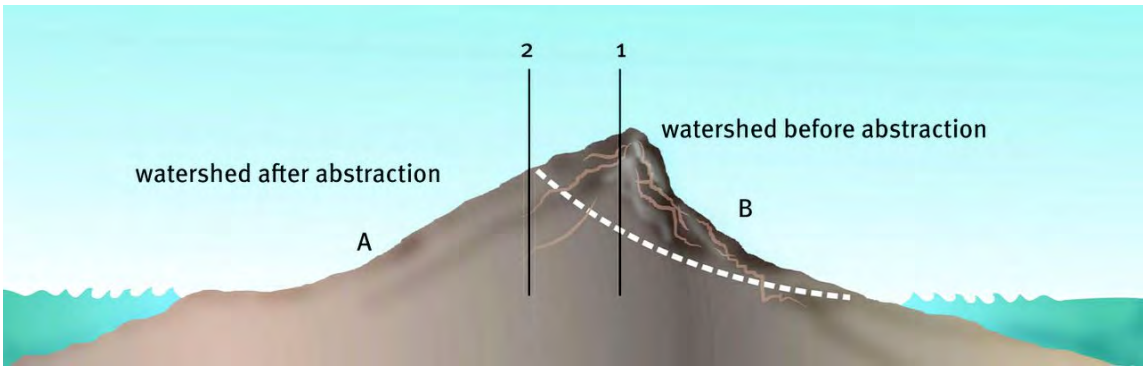


Figure 52 Abstraction due to more rapid erosion of a steep slope. Rivers A and B flow on opposite sides of the watershed. Because river B flows down a steeper slope than river A, river B will be more energetic, and therefore causes erosion to be faster. The watershed moves from position 1 to position 2. As a result, the drainage basin of the more energetic stream (B) grows.

5.2 River capture

River capture occurs where a river cuts through a watershed and intercepts a river flowing on a higher level. An example of this is the Kunene River in Namibia. The Kunene used to flow to the Etosha pan, but was intercepted in its middle course by an eastward eroding river from the coastal plain to the sea (Figure 53).

Figure 53 River capture by the Kunene has cut off the water supply to the Etosha Pan.

5.3 What are the features associated with river capture?

The following features are associated with river capture (Figure 54).

- The captor stream is the river which captured the waters of the other river.
- The river whose waters were captured is called the captured stream.
- The stream that has lost its water now flows in a valley that is too big for the stream. This stream is called the misfit stream.
- The elbow of capture is the place where the stream piracy has taken place.
- The wind gap is the dry river valley with river gravel between the elbow of capture and the misfit stream.

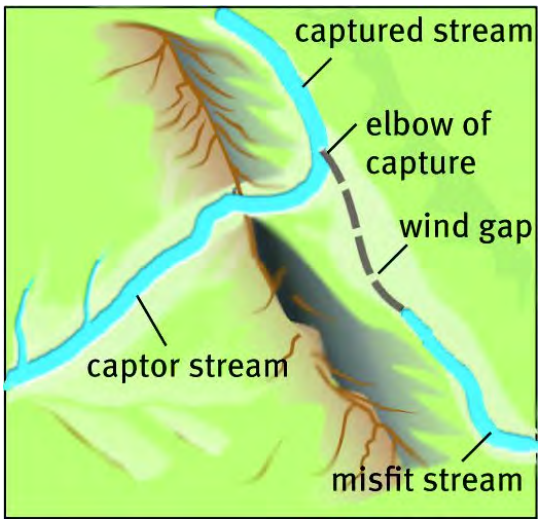


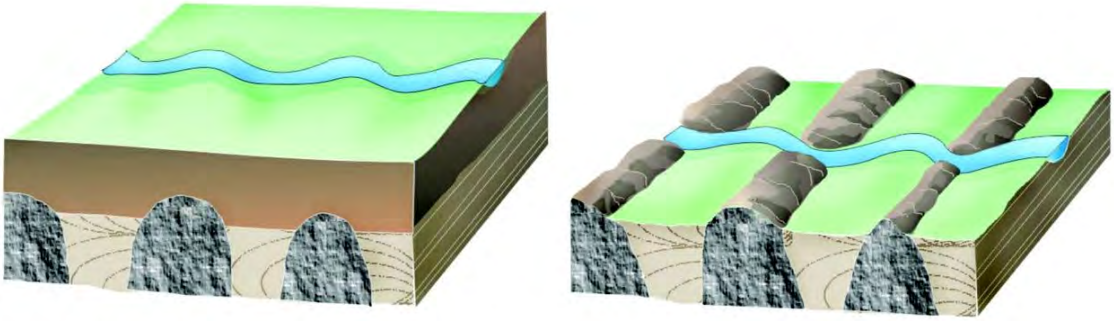
Figure 54 Features associated with river capture

6 What are superimposed and antecedent drainage patterns?

You have already learnt that drainage patterns are influenced by the hardness or softness of the underlying rock and the patterns of faults or fractures in these rocks. Sometimes the drainage pattern does not relate to the rock structures or landscape over which it flows. When this occurs, it is due to superimposed drainage or antecedent drainage. The difference between superimposed and antecedent drainage is that the superimposed stream is younger than the structure through which it flows while the antecedent is stream is older.

6.1 Superimposed drainage patterns

Superimposed drainage exists where a river established its course in rock layers which have been removed by erosion (Figure 55). The stream which subsequently imposed its course on underlying rocks of a completely different nature is called a superimposed stream. Superimposed streams are younger than the structures through which they cut.

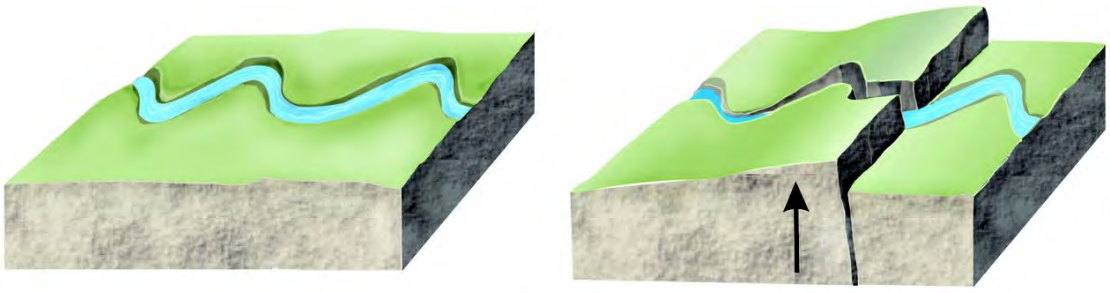


A Before removing of overlying rock layer B After removal of overlying rock layer

Figure 55 A superimposed stream, before erosion of the overlying rock layer (A) and after erosion (B)

6.2 Antecedent drainage patterns

An antecedent stream existed on an earlier landscape that was subsequently raised. The stream was able to maintain its original course, in spite of uplift or the formation of a mountain or ridge from below. The stream cut through the obstruction as it was formed. The uplift may be due to folding, faulting or warping. The term antecedent refers to the fact that the course of the river developed before the uplift occurred (Figure 56).



A before uplift B after uplift as a result of faulting of the plateau

Figure 56 An antecedent stream eroding into an uplifted plateau

Unit 3 Catchment and river management

Management of catchment areas (the area over which rain falls that is caught by a drainage basin) and rivers occurs when people try to control or alter the natural flow of water.

1 Why is managing drainage basins and catchment areas important?

- Drainage basins are managed for irrigation purposes.
- It is important to manage river flow by building dams to ensure a permanent source of water.
- Rivers need to be managed to provide flood control. This can be done by preventing settlement below the flood line, by building dams, or by diverting water away from settlements.
- Catchment management is necessary to protect water resources and make water use sustainable.
- Rivers can be used for recreation, like water sports. caravan parks and holiday resorts are also sometimes found along rivers and next to dams.
- Management is needed to control pollution.

2 What are the impacts of people on drainage basins and catchment areas?

- River water is polluted by industrial effluent, agricultural run-off and untreated sewage.
- The nature of run-off can be changed by building dams.
- Removal of vegetation can lead to flooding.
- Cities and other structures built on the floodplain of the river decrease infiltration. This can lead to flooding in urban settlements.
- Swamps, which serve as sponges during flooding, are drained.
- The ecology of rivers and their catchment areas is disturbed by the removal of water for irrigation, industry, mines and domestic use.
- Meanders can be eliminated by means of channels.
- Inter-basin transfer of water involves the transfer of water from areas with a water surplus to those with a water shortage.

Questions

Question 1

Answering multiple choice questions is an excellent way to revise your work. Answer as many as you can without looking at the text book. Use your text book to help you with the ones you cannot answer correctly.

Match the question with the correct option.

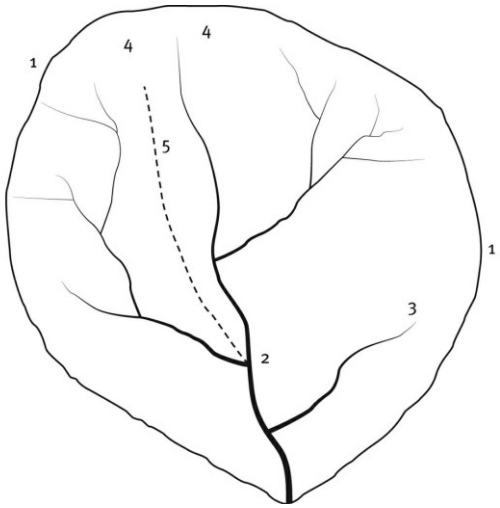


Figure 1

1.1 In Figure 1 the line marked 1 shows ...

A an interfluve
B a drainage basin
C the area surrounding rivers
D the river mouth
E the headwaters

1.2 In Figure 1 the point marked 2 shows ...

A an interfluve
B a drainage basin
C a watershed
D a confluence
E none of these

1.3 In Figure 1 the stream order at 2 is ...

A 1
B 2
C 4
D 5
E none of these

1.4 In Figure 1 the line at 3 shows ...

A an interfluve
B a drainage basin
C a watershed
D a confluence
E a tributary

1.5 In Figure the area around 4 shows ...

A the headwaters
B the mouth
C an interfluve
D confluences
E none of these

1.6 In Figure 1 the line at 5 shows ...

A a tributary
B a drainage basin
C a watershed
D a confluence
E an interfluve

1.7 Streams generally erode ...

A along both banks in a stretch of straight water
B along the inner banks of a meander
C along the outer banks of a meander
D along the stream bottom
E none of the above

1.8 Which of the following statements are NOT true?

A interlocking spurs are formed by deposition

B vertical erosion occurs in steep parts of the river's course

C rapids are a series of little waterfalls

D ox-bow lakes are formed from wide meander loops

1.9 Which of the following features would you NOT find in the lower stage of a river?

A flood plain

B rapids

C levees

D estuaries

E C and D

1.10 If all other factors remain constant except the stream becomes ... at some point, the water will speed up.

A shallower

B narrower

C sandier

D B and C

1.11 Braided streams occur where the channel floor is ...

A very deep

B very narrow

C very wide

D very flat

E very flat and wide

1.12 Which statement is correct?

A As rivers reach their lower course they widen, the gradient decreases and the discharge increases.

B As rivers reach their lower course they widen the gradient decreases and the discharge decreases.

C As rivers reach their lower course they get narrower, the gradient decreases and the discharge increases.

D As rivers reach their lower course they get narrower, the gradient decreases and the discharge decreases.

1.13 Which statement describes the upper course of a river valley?

A narrow valley floor, steep sides, and gentle gradient

B narrow valley floor, gentle sides, and steep gradient

C wide valley floor, steep sides, gentle gradient

D wide valley floor, gentle sides, steep gradient

E none of these

1.14 Which of the following is true of vertical erosion?

A widens the valley, common in the upper stages of a river, when the gradient is gentle

B deepens the valley, common in the lower stages of a river, when the gradient is steep

C deepens the valley, common in the lower stages of a river, when the gradient is gentle

D deepens the valley, common in the upper stages of a river, when the gradient is gentle

E deepens the valley, common in the upper stages of a river, when the gradient is steep

1.15 Controlling the river can be done by which one of the following?

A increase the capacity of the river channel, straighten the river channel and build relief channels

B decrease the capacity of the river channel, straighten the river channel and build relief channels

C increase the capacity of the river channel, make more bends in the river channel and build relief channels

D increase the capacity of the river channel, straighten the river channel and build no relief channel

1.16 Knickpoints are best associated with ...

A backswamps

B meandering streams

C deltas

D waterfalls and rapids

E oxbow lakes

1.17 What is a superimposed stream?

A a stream that has been captured and then rejuvenated

B a stream that exists on a elevated landscape

C a stream that has been captured and then takes its course over a faulted or folded landscape

D a stream that takes its course from a former overlying layer

1.18 What is the base level of erosion?

A when a river enters a lake or a dam, the water level represents the base level of erosion

B when the river has cut down to the pediment and there can be no further scarp retreat

C when the river is rejuvenated by the global drop in sea level

D when the river has reached the pediment

E both A and B

1.19 A graded stream occurs ...

A when velocity and discharge are balanced

B when the river is saturated and deposits material on its bed

C when there is neither erosion nor deposition

D when the river has been rejuvenated

E both A and C

1.20 The longitudinal profile of a river ...

A is the diagrammatic representation of the shape of the river channel as seen from above

B causes the permanent and temporary base levels of a river

C the convex shape of the river from the source to the mouth of the river

D the diagrammatic representation of the relationship between the relief and length of a given river

E both A and D

20×2=(40)

Question 2

Learning the correct meanings to the terms is another excellent way of revising your work. You cannot answer a question if you do not know the meaning of the words used in the question.

Match the columns of these terms commonly used in this section.

	Term		Meaning
2.1	Antecedent drainage	A	The point where two or more streams meet and form a larger stream
2.2	Base level	B	The wearing away of the land by weathering and erosion
2.3	Braided river	C	The concept of equilibrium related to the profile of a river
2.4	Confluence	D	Occurs when all irregularities such as waterfalls have been eliminated
2.5	Dendritic drainage	E	Become deepened and cut down into the landscape usually as a result of increased erosion caused by rejuvenation
2.6	Denudation	F	A pattern of rivers in which the flow of water is away from a central high point
2.7	Deposition	G	A drainage pattern which looks like a tree when viewed from above
2.8	Drainage basin	H	The area which is drained by a river and its tributaries
2.9	Grade	I	The level below which the land cannot be denuded by rivers
2.10	Graded profile	J	The laying down of material which has been removed by denudation
2.11	Headward erosion	K	Shows the changes in the altitude of a river's course from source, along its channel, to sea level
2.12	Incised meander	L	A river system that was formed before the uplifting of relief as a result of earth movements
2.13	Interfluve	M	A bend or curve in the course of a river
2.14	Knickpoint	N	A stream that is too small for the size of its valley which may be because of river capture
2.15	Long profile	O	A river that splits into two or more channels that rejoin further downstream
2.16	Meander	P	The renewal of the erosive power of a river because of a change in gradient in the river's long profile or the arrival of extra water
2.17	Misfit	Q	Found on the inside of a bend in a meander
2.18	Radial drainage	R	A break in the longitudinal profile of a river which may be as a result of rejuvenation caused by the uplift of the land
2.19	Rejuvenation	S	The area between two rivers
2.20	Slip-off slope	T	A type of erosion which occurs at the source of a stream

20×2 = (40)

Question 3

Study Figure 2 and answer the questions that follow.

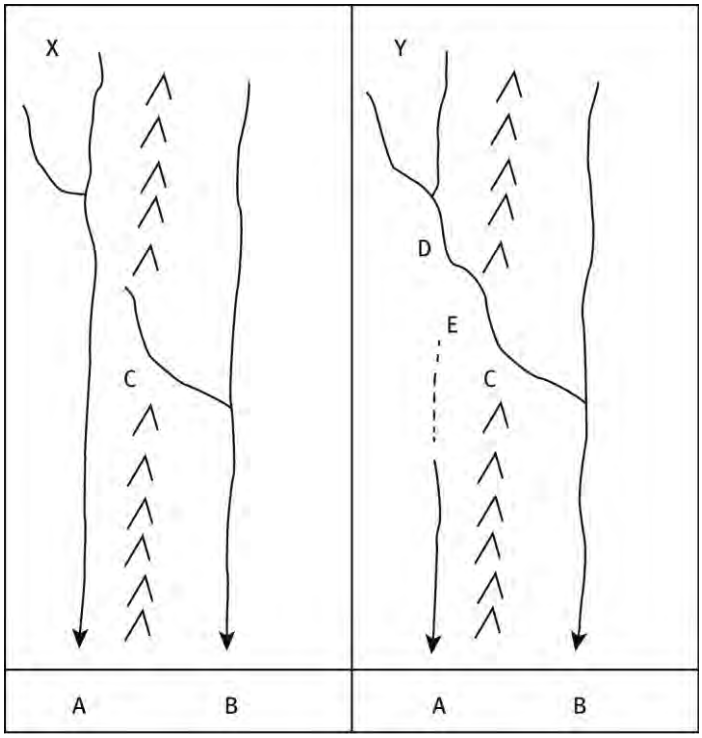


Figure 2

3.1 Name the process illustrated in Figure 2. 1×2=(2)

3.2 List the labels for the characteristic features A to E shown on map Y in Figure 2. 5×2=(10)

3.3 Describe the steps in the process that led to the landscape in map Y. 3×2=(6)

3.4 Explain why river B in map Y has been rejuvenated. 1×2=(2)

3.5 List three landforms that could result from this rejuvenation. 3×2=(6)

(26)

Question 4

Study the maps in Figure 3 below, showing two areas with different drainage densities and patterns, and then answer the questions that follow.

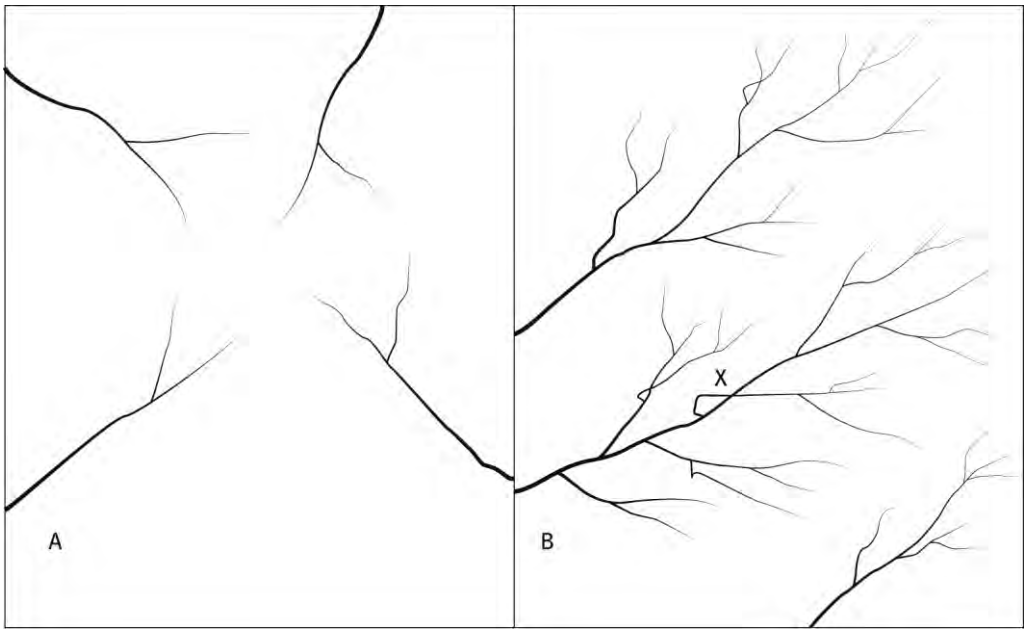


Figure 3

4.1 Give two reasons why area A has a lower drainage density than area B. 2×2=(4)

4.2 Calculate the stream order at point X in area B. 1×2=(2)

4.3 Explain why a drainage density as shown in area A will cause problems for the people living in the area. 2×2=(4)

4.4 Describe three ways in which the activities of people can have an impact on area B. 3×2=(6)

4.5 Name the drainage patterns in areas A and B. 2×2=(4)

(20)

TOTAL MARKS [86]

Answers to Questions

Question 1

1.1	B ✓✓
1.2	D ✓✓
1.3	C ✓✓
1.4	E ✓✓
1.5	A ✓✓
1.6	E ✓✓
1.7	C ✓✓
1.8	A ✓✓
1.9	B ✓✓
1.10	B ✓✓
1.11	E ✓✓
1.12	A ✓✓
1.13	E ✓✓
1.14	E ✓✓
1.15	A ✓✓
1.16	D ✓✓
1.17	D ✓✓
1.18	A ✓✓
1.19	C ✓✓
1.20	D ✓✓

20×2=(40)

Question 2

2.1	L ✓✓
2.2	I ✓✓
2.3	O ✓✓
2.4	A ✓✓
2.5	G ✓✓
2.6	B ✓✓
2.7	J ✓✓
2.8	H ✓✓
2.9	C ✓✓
2.10	D ✓✓
2.11	T ✓✓
2.12	E ✓✓
2.13	S ✓✓
2.14	R ✓✓
2.15	K ✓✓
2.16	M ✓✓

2.17 N ✓✓
2.18 F ✓✓
2.19 P ✓✓
2.20 Q ✓✓

20×2=(40)

Question 3

3.1 River capture or stream piracy ✓✓ 1×2=(2)

3.2 A Captured stream ✓✓
B Captor or pirate stream ✓✓
C Watershed ✓✓
D Elbow of capture ✓✓
E Windgap ✓✓ 5×2=(10)

3.3 Stream B eroding actively through watershed at C – headward erosion ✓✓ through watershed ✓✓ captured headwaters of stream A ✓✓ 3×2=(6)

3.4 River B has been rejuvenated by receiving the flow as a result of the river capture. ✓✓ 1×2=(2)

3.5 Incised meanders, ✓✓ alluvial terraces, ✓✓ knickpoint waterfalls/rapids ✓✓ 3×2=(6)

(26)

Question 4

4.1 In a drier area with little rainfall. ✓✓ Sandy soil causing more infiltration and little surface water. ✓✓ 2×2=(4)

4.2 Stream order is 3. ✓✓ 1×2=(2)

4.3 Little surface water causing dry soil – farmers would need to irrigate. ✓✓ Lack of water for urban areas causing service problems. ✓✓ Greater expense involved in providing water for development. ✓✓ 2×2=(4)

4.4 Farmers using water for irrigation would mean less water for people downstream. ✓✓ Building dams could cause ecological problems. ✓✓ Increased pollution from human activities such as agriculture and industry. ✓✓ (Any other acceptable answer) 3×2=(6)

4.5 A – radial ✓✓ B – dendritic ✓✓ 2×2=(4)

TOTAL MARKS [86]

Topic 3 Rural and urban settlement

Unit 1 Study of settlements

1 What is the concept of settlement?

A settlement is a group of people who live, work and interact together in a cluster of building structures, interlinked by communication.

1.1 Nature of settlements

A settlement may be as small as a single house in a remote area or as large as a huge city. A settlement may be permanent or temporary. An example of a temporary settlement is a refugee camp. However, a temporary settlement may become permanent over time.

2 What are site and situation?

2.1 Site

Site is the land on which a settlement is built. Early settlers were looking for water supply, fuel, farming land, shelter and defence (Figure 57). Ideal sites tended to be:

- flat or gently sloping
- well drained (not marshy) and free from any risk of flooding
- close to a permanent water supply
- sheltered from strong wind
- steep-sided hills.

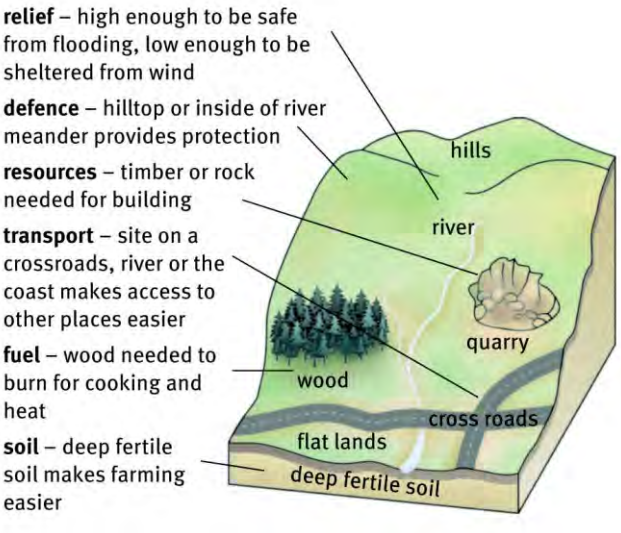


Figure 57 Factors that influence the selection of a site for a settlement

2.2 Situation

Situation is the location of a settlement in relation to the surrounding area (Figure 58). A settlement with good access to natural resources and to other settlements will grow in size. At a larger scale, towns grow and prosper from a favourable situation.

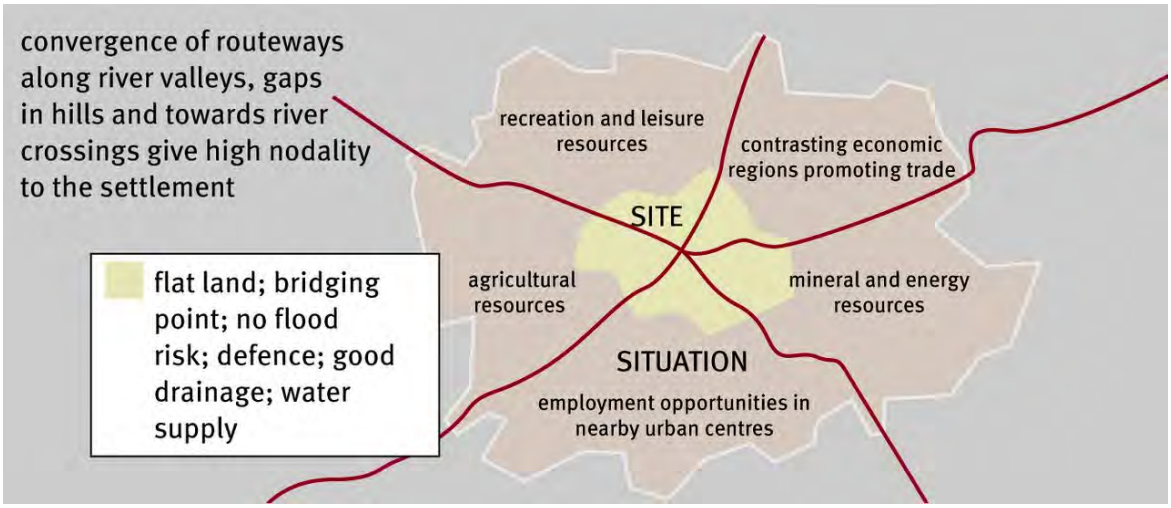


Figure 58 Factors that influence situation

3 What are the differences between rural and urban settlements?

A rural settlement is a single function settlement where most of the people are engaged in a primary economic activity, usually farming. This may range from large commercial farms to small subsistence farms and is described as unifunctional.

An urban settlement is a multi-function settlement and consists mainly of people engaged in secondary and tertiary activities. Urban settlements are characterised by more numerous, larger and more densely position buildings and more complicated infrastructure. They are multifunctional.

4 Settlement classification according to size, complexity, pattern and function

Table 14 Classification of settlements	
Size	**Complexity**
Population size	**Purpose of buildings (services)**
Isolated farmstead: 1–10 Hamlet: 11–100 Village: 101–2 000	• Smallest settlement type made up of single farmhouse. • Loose grouping of farmsteads – more or less six houses and a church. • A number of essential functions. The main function is primary, but the following activities also occur – butcher, baker, primary school, and possibly a doctor's surgery.
Town: 2001–100 000 City: 100 001–1 000 000 Metropolis: 1 000 001–2 000 000 Conurbation: 2 000 001–10 000 000 Megalopolis: over 5 000 000 World city	• Number of functions increases – major supermarkets, secondary schools, cinemas and, usually, railway and bus stations. • Wide range of functions, including headquarters of the region's administration. • Large city or urban agglomeration. • Largest area of urban development – the result of originally seperate towns and cities growing outwards and joining together. • A megacity • Large city with international function

Pattern		**Function**	
Refers to the spacing of buildings. Rural settlements can be either:		**Refers to economic activity**	
Dispersed, with buildings apart from each other	Nucleated, with buildings close together	A settlement is rural if it is unifunctional, which means it has one function, usually a primary activity like agriculture.	RURAL
Urban settlements are always nucleated or clustered; they have a dense grouping of buildings.		Urban settlements are multifunctional, which means they have more than one function or many functions. These functions will be secondary, tertiary or quarternary.	URBAN

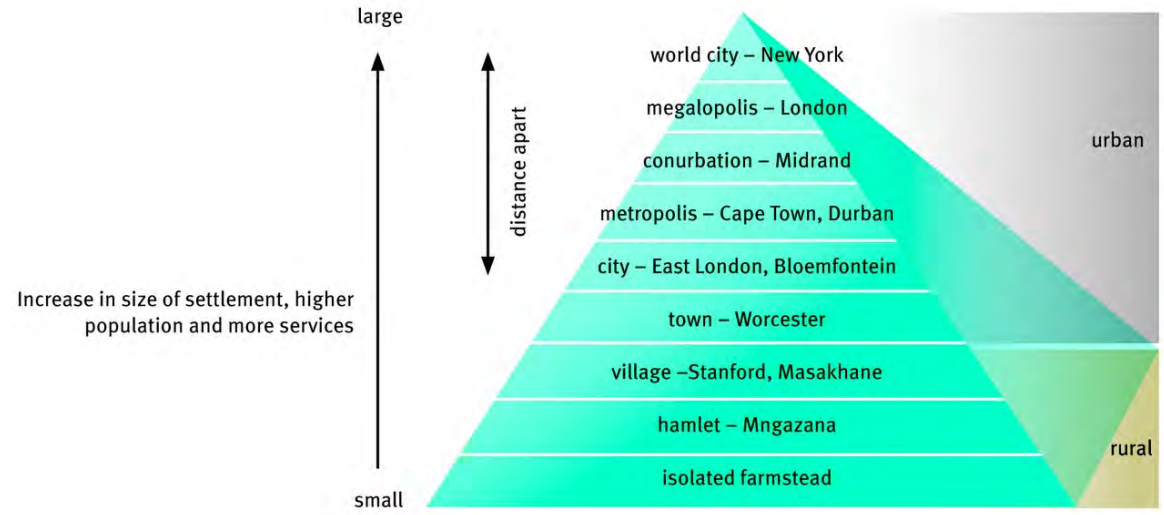


Figure 59 Classification of settlements in terms of size

Unit 2 Rural settlements

1 How do site and situation affect the location of rural settlements?

1.1 What factors influence the choice of site?

Originally settlements had to be at good defensive sites and satisfy the basic needs of its inhabitants. These basic needs are:

- The availability of drinking water. This could be from rivers or springs.
- The availability of building materials. This would mainly be trees but includes rocks and thatching grass.
- Closeness to arable land. The inhabitants need to have fertile soils to grow their crops.
- The availability of transport routes.
- Pasturage for livestock. Their cattle, goats or sheep have be able to graze.
- Fuel for warmth and cooking. This would usually be from trees but in many treeless areas cow dung is used as a fuel.

2 Classification of rural settlements according to pattern and function

2.1 Pattern

Rural settlements can be either nucleated or dispersed.

2.1.1 Dispersed or isolated rural settlements

These occur where isolated farmsteads are located each on its own land and sometimes kilometres from its nearest neighbour.

2.1.2 Nucleated (clustered) rural settlements

A nucleated (or clustered) rural settlement pattern comprises a denser group of dwellings and other buildings. In farming villages the farmers usually live as a group in a central village and work in the surrounding fields by day. The buildings are usually clustered around a central point such as a water point.

Table 15 Advantages and disadvantages of dispersed and nucleated settlements	
Dispersed	**Nucleated**
Advantages are economic in nature: • Farmer works for him/herself and keeps own profits. • Farming is more efficient. • Farmer can use his/her own initiative. • Farmer lives on his/her own single tract of land. • Farmer can maximise the use of machinery as it does not have to be shared with other farmers.	**Advantages are social in nature:** • Daily social contact – community involvement. • People do not live in isolation. • Protection is easier when people are together. • There are enough people to share the work. • There is a possibility of co-operative farming. • Farmers can agree each to plant a different crop and share the cost of ploughing and fertilising land.
Disadvantages are social in nature: • There is no social contact, far from neighbours. • No protection. Lack of security as people living on their own are more vulnerable. • No help if the farmer is sick or disabled. • Essential services (like medical care, schools, shops) are far away, which can be dangerous if there is an emergency.	**Disadvantages are economic in nature:** • There is no independent decision making. • Individuals cannot show initiative. • Fields are scattered, which wastes time. • Machinery is shared. • It is difficult to be economically successful. • Travelling from the village to the farm is time-consuming and uneconomic. • Plots may be too small to be economically viable. • Modern farming methods cannot be applied effectively.

2.2 Function

All settlements except the very smallest have a variety of functions. In rural areas the main functions of settlements have been:

- to provide agricultural services, including a market for produce, and so they become transport centres
- to provide a place for defence in times of war.

3 What are the reasons for different shapes of settlements?

Shape or form refers to the plan outline of the built-up area of a settlement. Settlements may be linear (ribbon-like), rectangular, circular or star-shaped (Figure 60). The shape of a settlement is influenced by:

- positive factors, such as transport routes and flat land which encourage growth
- negative factors, such as flood-prone valleys, which limit growth.

3.1 Round and square villages

Square or round settlements have houses clustered around a focal point, which is the centre of importance for that community. This may be a well, kraal, church, market square, or village green.

3.2 Linear villages

Linear settlements are a combination of dispersed and nucleated patterns. The farmsteads are arranged close to one another on both sides of thoroughfares such as roads, rivers, valleys and railway lines The properties in linear villages are long and narrow and have a narrow front along the central thoroughfare.

3.3 T-shaped and cross-road villages

Cross-road settlements can be T-shaped settlements or star-shaped. They are found at road junctions.

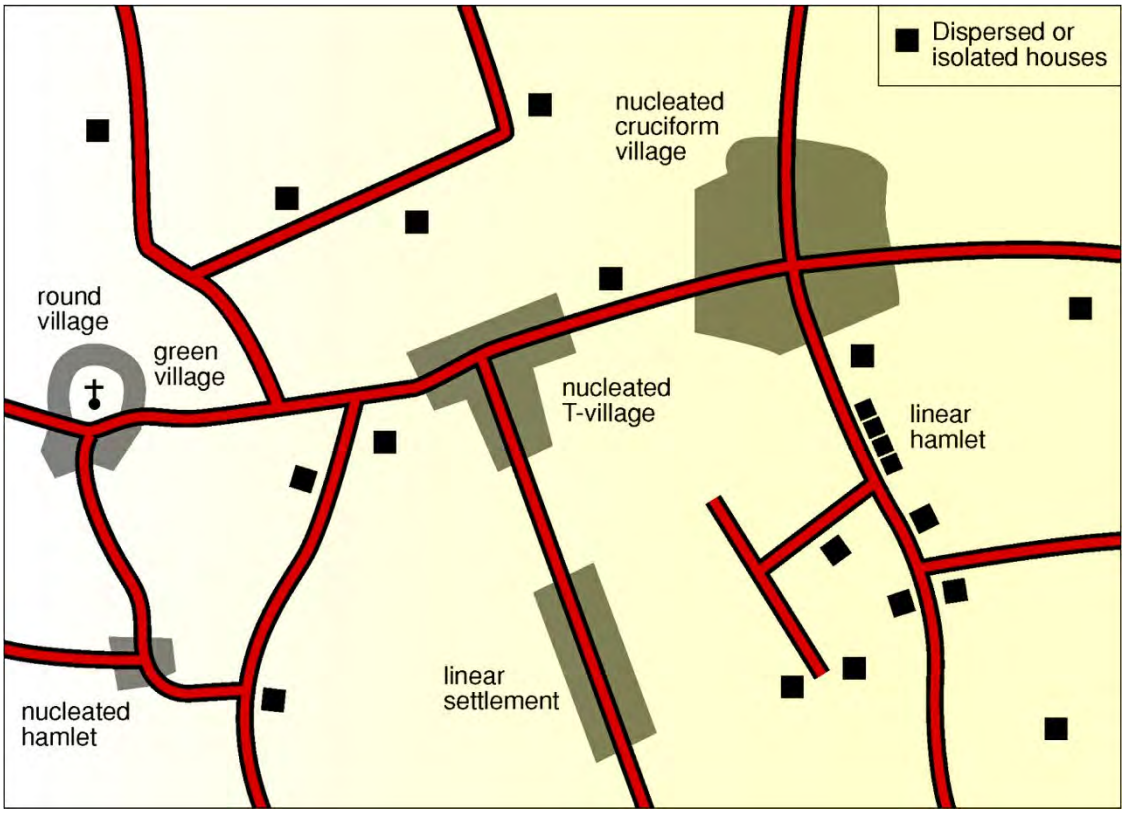


Figure 60 Different shapes of rural settlements

4 Land use in rural settlements

4.1 What are the characteristics of rural land use?

Land use refers to the function of an area of land – the purpose for which land is used. Land use in rural areas has different features from that in urban areas. Some of these are:

- residences for country workers, commuters and seasonal workers
- farming and forestry
- natural resources development of minerals, water supply.

Unit 3 Rural settlement issues

1 What is rural–urban migration?

The percentage of people living in cities increases steadily through rural–urban migration. Poor harvests, lack of money and inadequate services are 'push' factors that encourage people to move away from rural areas. The possibility of paid employment, better education and healthcare 'pull' people to cities.

The cycle of poverty illustrated in Figure 61 explains the situation which traps many rural populations with declining economic prospects.

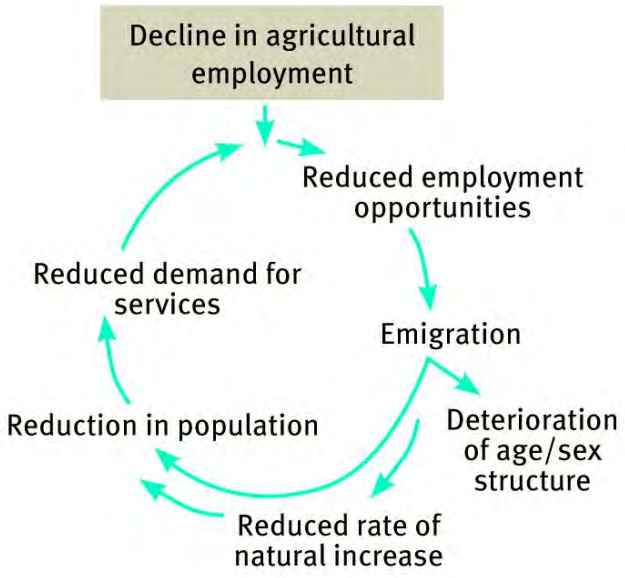


Figure 61 The cyclical nature of rural decline, or poverty cycle

2 What are the causes and consequences of rural depopulation on people and the economy?

The period of rapid urbanisation is caused mainly by the attraction of industrial jobs, which causes rural depopulation. Movement to the city is partly due to 'rural push' (repelling action) and partly due to 'urban pull' (attraction). These are summarised in Table 16.

Table 16 Some push/pull factors causing urbanisation and rural depopulation		
Push factors (repelling migrants from the countryside)	**Barrier (reasons why moving may be difficult)**	**Pull factors (attracting migrants to the cities)**
Unemployment Mechanisation on farms Poor medical and family planning services Few primary and secondary schools Poor housing and services Limited socialising opportunities Widespread poverty Natural hazards Population pressure leading to insufficient land	Costs Dangers Distance Transport Leaving family	Better career prospects Better medical and family planning facilities Better educational opportunities Better housing Better social life Better shops, transport and communications Higher wages and standards of living Less threat from natural hazards Relatives have migrated

3 What are the effects of rural depopulation and the strategies to address them?

Central place towns that are accessible to rural areas depend on the buying power of the farming population. Reduced spending in towns means that many shops and businesses in these towns cannot survive, and they close. Employment opportunities decrease and more people migrate to cities. The rural landscape gradually becomes depopulated. The downward cycle of rural poverty starts. Stopping, preventing and reversing this trend involve a highly organised system of planned, co-ordinated action on the part of the government, local authorities, and business.

4 What are the social justice issues in rural areas?

4.1 Access to resources

Poverty and lack of access to resources hinder access to social justice in rural areas worldwide. In order to alleviate rural poverty, the present government aims to develop viable co-operative businesses for small-scale farmers. Linking small-scale farmers with commercial farmers enables them to participate in both the domestic market and the lucrative global markets.

4.2 Land reform

In South Africa, land is a highly contested resource. On the one hand, private ownership of productive land favours a racial minority, while on the other hand there is a need to strike a balance between ownership and the benefits from use of land. The current South African government aims to alleviate poverty, especially in rural areas, by transferring land ownership to the millions of South Africans who have been denied access to this economic resource. It intends to achieve this objective through land reform programmes.

Unit 4 Urban settlement

1 What are the origin and development of urban settlements?

1.1 Urbanisation of the world's population

On a global scale towns and cities are expanding rapidly. By 1995 over 45% of the world's population lived in urban areas. In most MEDCs over 70% of the population lives in towns and cities. By contrast, in many African and Asia LEDCs, only 33% of people are urban dwellers.

1.2 The growth of towns and cities

Urbanisation in MEDCs began as a result of the Industrial Revolution during the nineteenth century. People migrated from the countryside to the towns looking for work in factories. Over time, towns expanded to become cities. Urban growth is the physical expansion of towns and cities.

2 How do site and situation affect the location of urban settlements?

A combination of physical factors making up the site and human factors determine where urban settlements are located.

2.1 Physical factors

The physical factors affecting the development of a site for urban settlement include:

- availability of fresh water
- underlying rock and soil structure
- relief – too steep slopes make building difficult, therefore flat land is preferred
- drainage – flooding is avoided
- aspect of slope – slopes facing the Sun are warmer (north facing slopes in the Southern Hemisphere and south facing slopes in the Northern Hemisphere)
- resources – minerals will encourage industrial development.

2.2 Social factors

The social factors affecting the selection of a situation for urban settlement include:

- transport routes – nodal points (where roads and rivers meet), towns near mountain passes or ports
- bridging points over rivers – to allow mobility
- harbours – to promote trade
- defensibility – hill-top settlements were important
- building materials – for construction
- food supply – to support growing populations.

3 How can urban settlements be classified according to function?

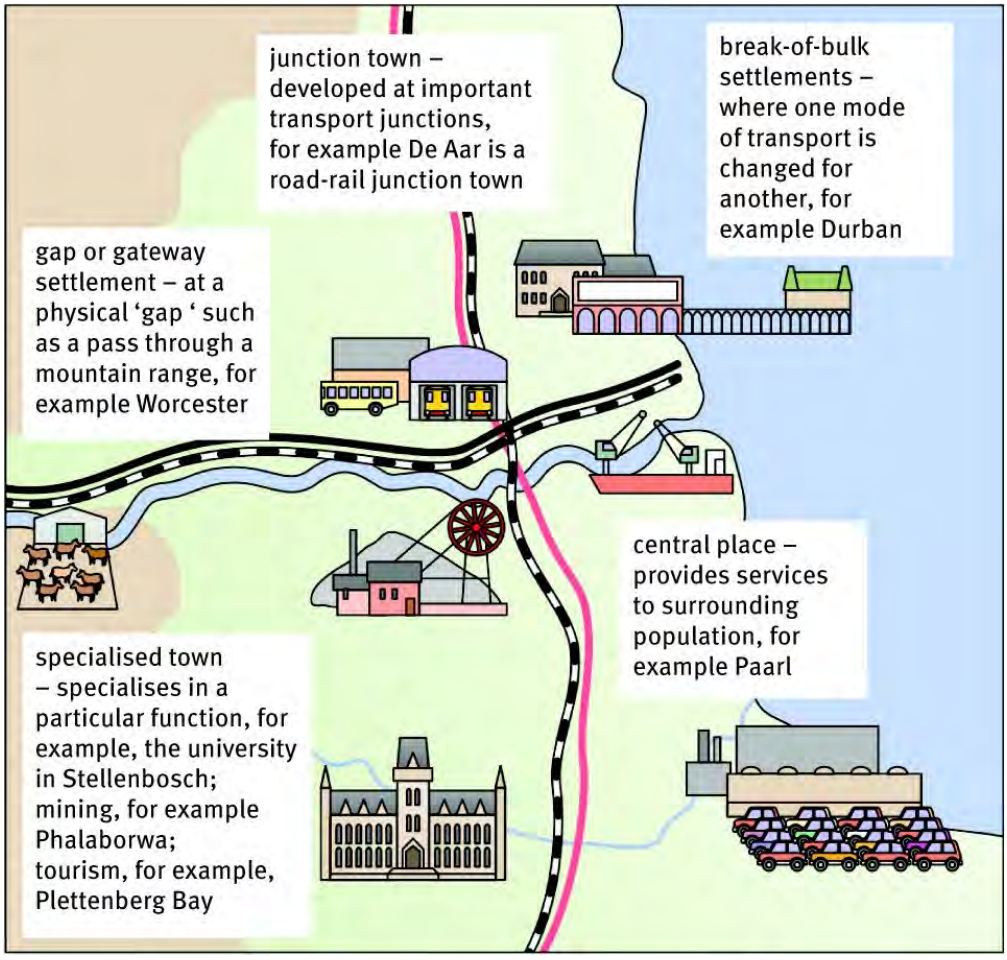


Figure 62 Examples of urban settlements classified according to their function

3.1 Examples of settlement functions

Central places – A central place is an urban settlement that provides urban services for the surrounding rural community. For example, Upington provides services to people living in the sparsely populated Northern Cape. Ermelo and Cradock serve as centrally located markets and service centres for the surrounding farming areas.

Trade and transport settlements – Urban settlements that established due to trade and transportation. For example, East London developed around a harbour.

Break of bulk points – Locations where one type of transport is replaced by another. For example, Durban harbour, where goods which have been transported by road or rail are loaded on board ships, and the other way around.

Specialised cities – Centres with one dominant function and the location of the centre is decided by the occurrence of natural resources such as fish, minerals, timber, agriculture or tourism, for example, Plettenberg Bay.

Junctions towns – Urban settlements that developed at important transport junctions such as river crossings, railway and road junctions. Junction points occur at junctions of rivers, rail routes and roads. For example, De Aar (Northern Cape) is a road-rail junction.

Gateway towns or gap towns – Gateways are natural gaps or passes through physical obstacles such as mountains. Roads converge at a point to make use of the gap. For example, Worcester (Western Cape) is situated near the Hex River Mountains Pass leading to the Karoo.

Unit 5 Urban hierarchies

1 What is urban hierarchy?

1.1 Urban hierarchy

The term 'hierarchy' refers to the arrangement of a settlement in a sequence or order of importance. At the bottom of a settlement hierarchy there are many low-order rural settlements, like villages, which offer few services. At the top of the hierarchy there is likely to be one high-order urban settlement, like a city, which will provide many specialised services.

1.2 Central place

Most urban settlements are central places supplying urban services to their surrounding rural communities

1.3 Threshold population

The minimum number of people required to support a shop or a service so that it remains profitable is called the threshold population. Large shops selling luxury items require a large threshold population while small shops selling convenience goods such as bread and milk have a low threshold population. A primary school has a lower threshold population than a high school.

1.4 Sphere of influence

The area that people travel from to use a shop (or service) is its sphere of influence, sometimes called the catchment area. Shops with a large sphere of influence depend on good transport links to bring shoppers to them. A primary school has a smaller sphere of influence than a high school.

1.5 Range of goods

The range of goods is the maximum distance people are prepared to travel to use a shop or service. People will travel further to buy a luxury motor car than they will to buy bread and milk. Low-order services will have small threshold populations and small range. A primary school has a smaller range of goods than a high school.

2 What are lower and higher order functions and services?

Functions and services are activities provided to meet people's needs. Examples include shops, schools, banks and sports centres. These shops and their services can be hierarchically organised and ranked from lower order functions to higher order functions (Figure 63). There is a direct correlation between population size and the range of services offered by settlements. Larger settlements offer a wider variety of services within a broader range than smaller settlements.

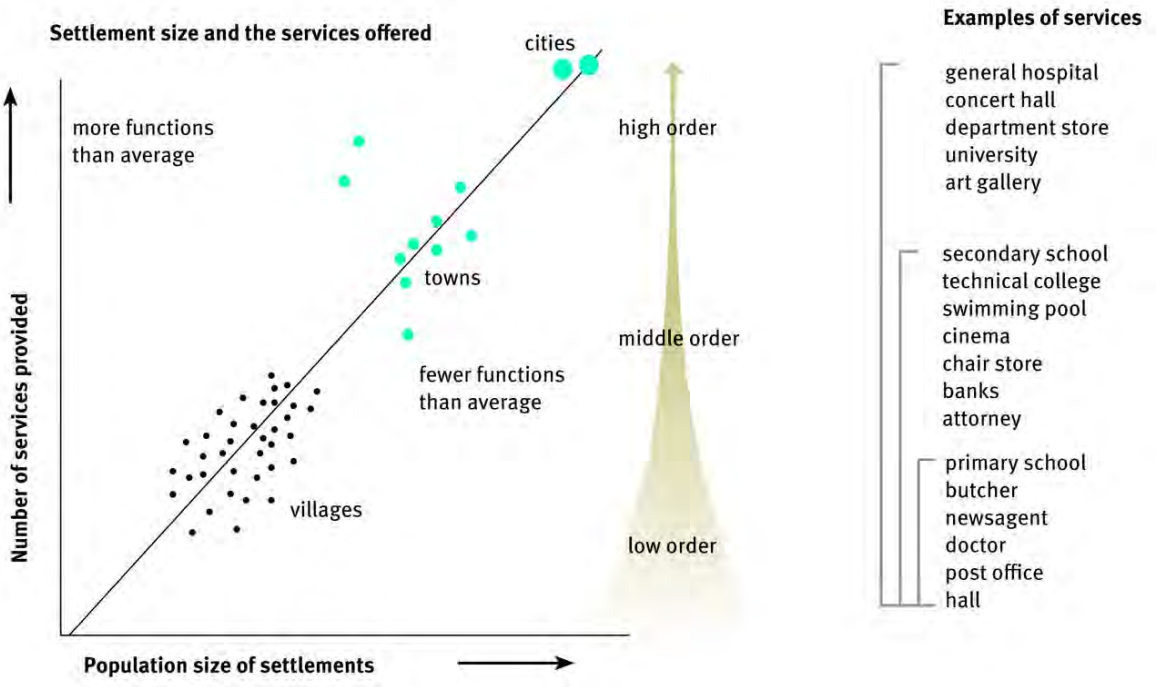


Figure 63 Hierarchical ordering of functions and services in terms of settlement size

3 What are lower and higher order centres?

There are more numerous lower order centres (smaller towns) and fewer higher order centres (large cities). Smaller towns have smaller populations, fewer services, more low order businesses and smaller ranges. Large cities have large populations and larger numbers of services, including many high order businesses with large ranges. A settlement's position on the hierarchy is determined by the number of functions and not only by the size of the population.

Unit 6 Urban structure and patterns

1 What are the internal structure and patterns of urban settlements?

1.1 Land use zones

Urban areas are not random developments, but have internal structure. If you walk through a town or city you will often find distinct land use zones. Each area (or zone) of a city has a distinct function, for example housing or industry. A study of land use maps shows that the different land use types are not distributed in an urban area in an arbitrary manner or in a disorderly way but in patterns, as Figures 64 and 65 show.

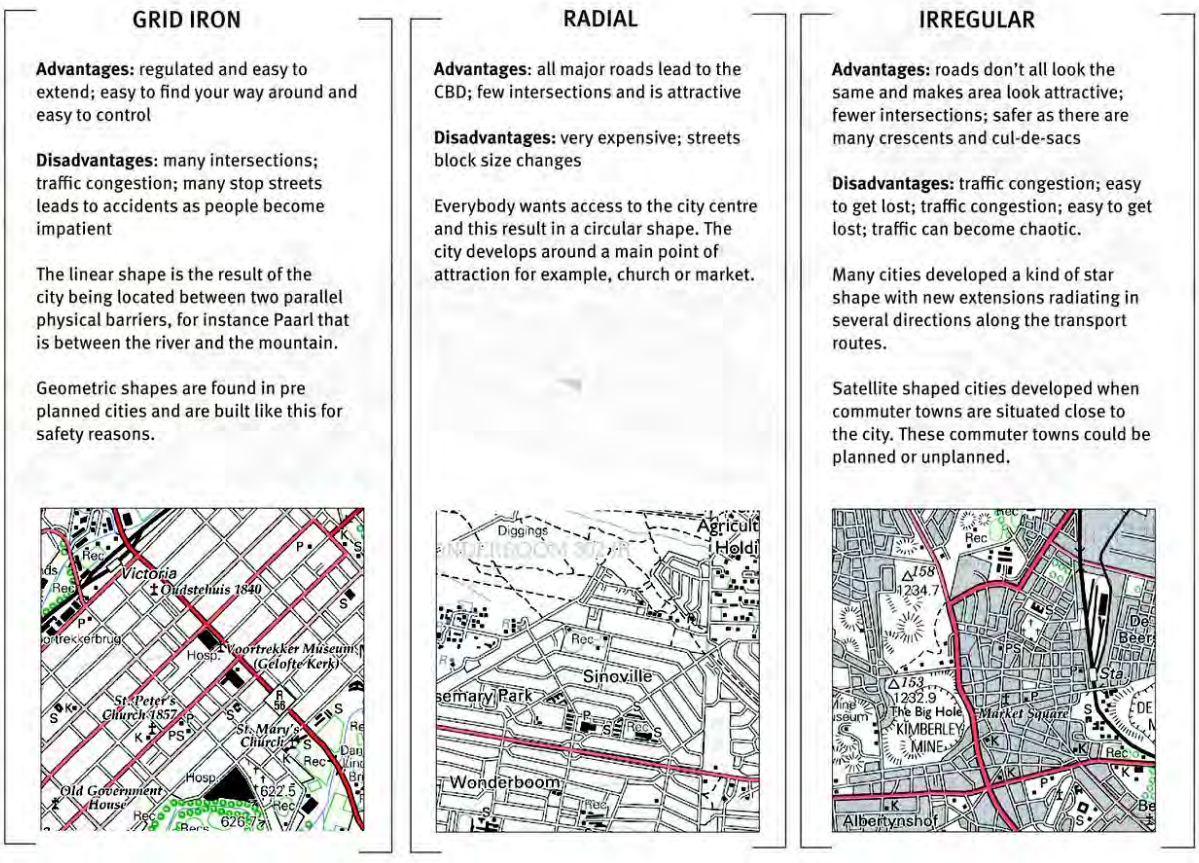


Figure 64 Street plans (ground plans) in urban areas

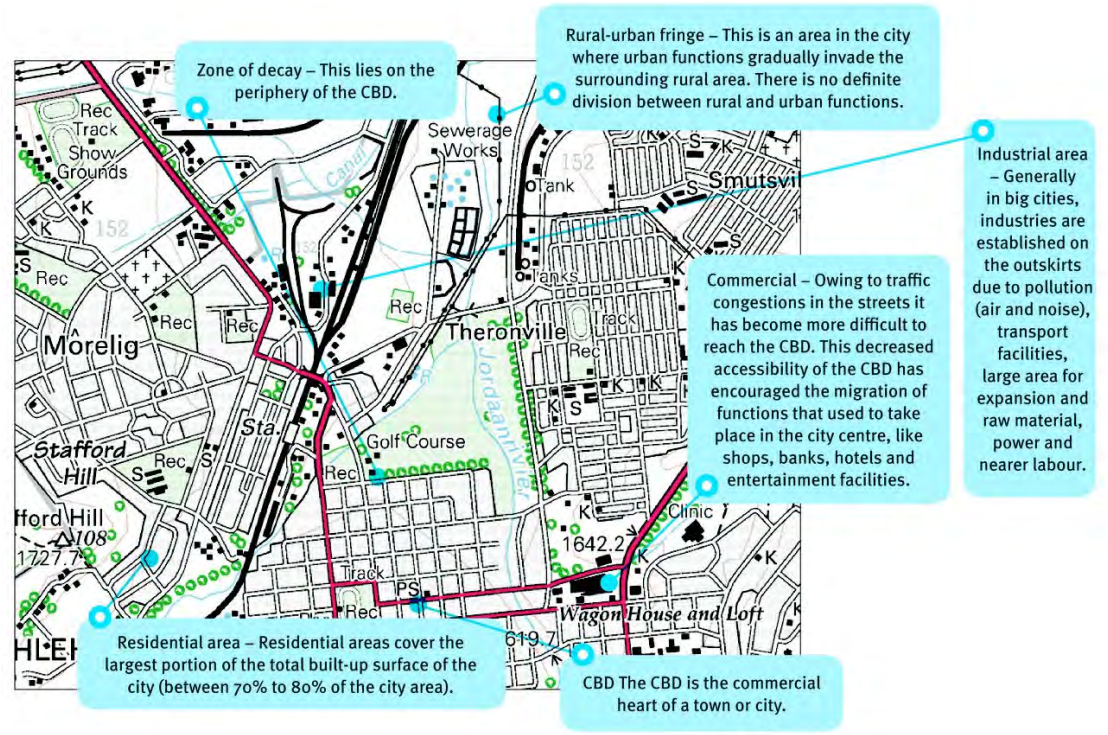


Figure 65 Urban land use shown on topographic map 2828AB BETHLEHEM

1.2 Urban profile

The urban profile shows a cross-section of the city from the CBD to the periphery (Figure 66). Most urban profiles show a concentration of high buildings surrounded by low buildings as you move towards less built-up areas. Together these form the morphological structure of a city.

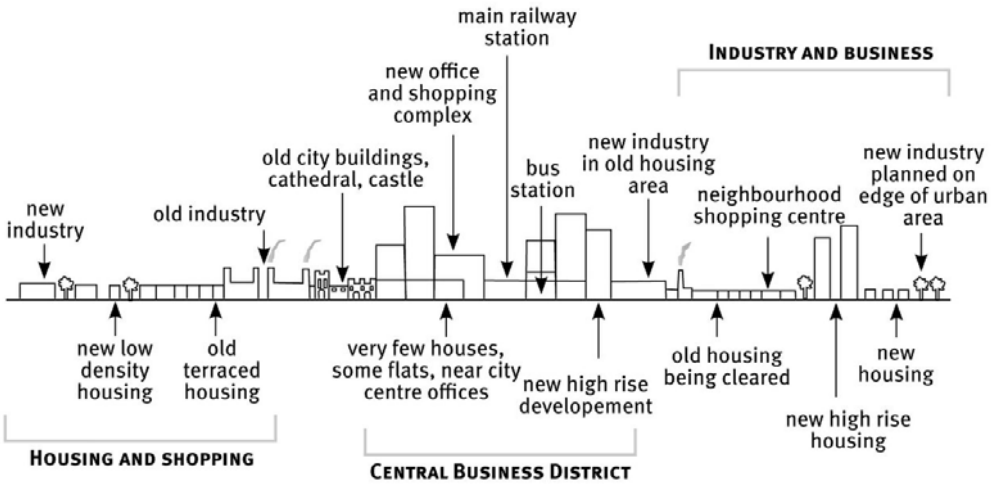


Figure 66 An urban profile is a view of a city as seen from the side.

1.3 What are the factors influencing the morphological structure of a city

The major factors influencing the morphological structure of a city are various physical factors, planning and transport.

1.3.1 Physical factors

- Relief – Cape Town developed between Table Mountain and the harbour. The steep slopes of Table Mountain and the coastline determined the structure of the city. Pretoria lies between Magaliesberg and Daspoort mountains and has a linear shape.
- Microclimate – Local climate also influences the form of an urban area; warmer north-facing slopes are preferred.
- Soil conditions – Fertile soils attract settlement.

1.3.2 Planning

- Planned cities – These cities are planned and are built as one unit and have an ordered structure and a modern street plan, for example Sasolburg.
- No planning – An urban area developed quickly, like in the case of Kimberly, or sometimes it is an ancient city. The cities have no specific city centre or street pattern.
- Piecemeal planning – Settlements in which each new suburb may have a different appearance, but there is evidence of urban planning. Most South African cities are examples of piecemeal planning.

1.3.3 Transport

Transport plays a vital role in the development of a city's structure. As transport systems improved and more people were able to buy cars, the towns became less compact. People could live away from the city centre and commute to their work places. As a result of this, urban sprawl is evident along the transport routes in many cities.

2 Models of urban structure

Urban land use is often explained by models. A model is a simplified theory that attempts to explain how things work. No model works perfectly but they do help to explain some of the features of urban structures. There are a number of these models: the concentric zone model, the sector model, the multiple nuclei model, the modern American-western city, the Third World city and the South African city.

2.1 The concentric zone, sector and multiple nuclei models

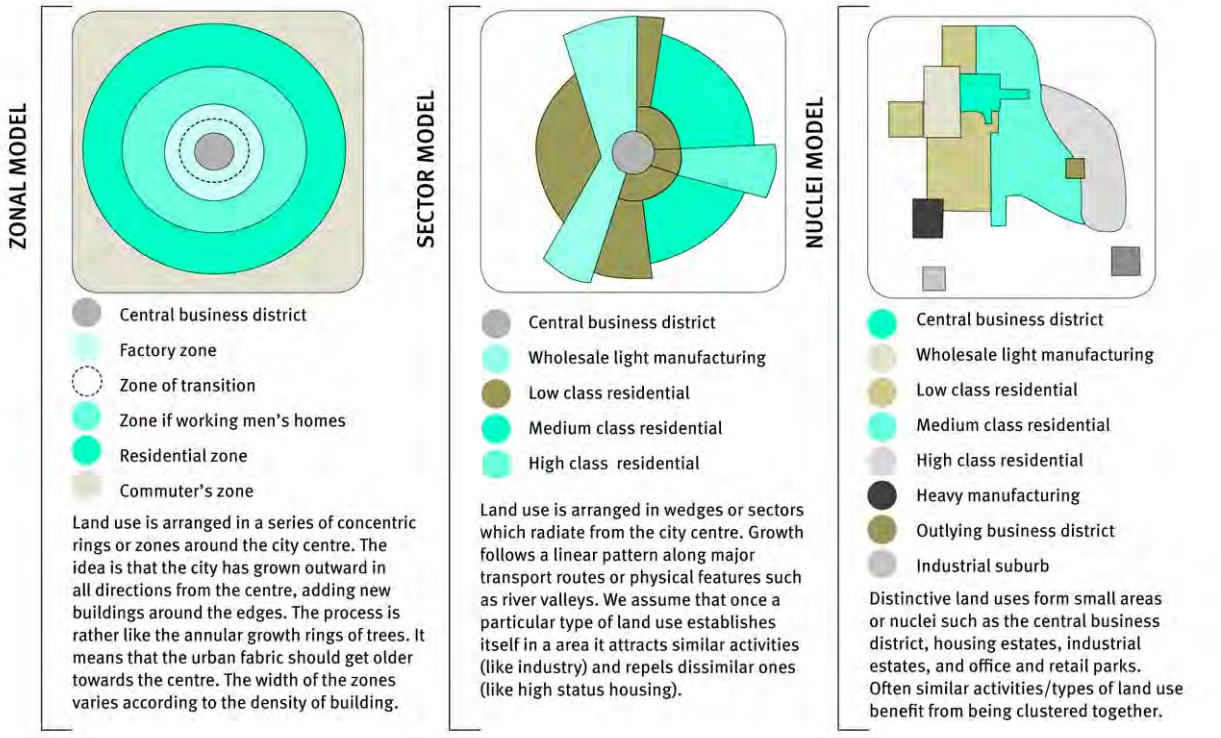


Figure 67 The three main models of urban structure are the concentric zone model, the sector model and the multiple nuclei model.

2.2 The modern American–western city

The modern American–western city is a type of city that developed as a result of rural-urban migration and the development of the motor car. Most of its population now move from the CBD to the suburbs. This causes commercial decentralisation. Unlike the Third world city, most of the economy generated in the modern American city is in the formal sector.

2.3 The Third World city

Cities in developing countries tend to develop their own distinctive pattern described by the Third World city model (Figure 68). This differs in several ways from the land use model in developed countries. There is rapid growth due to large scale rural-urban migration and high rates of natural population increase.

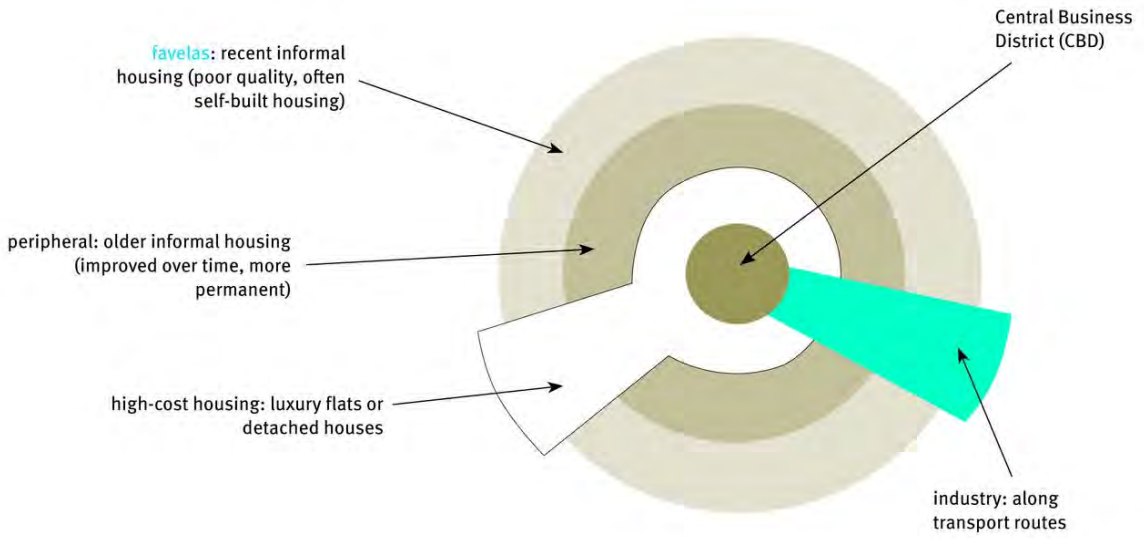


Figure 68 Land use zones in LEDCs

2.4 The South African city

The South African city model is unique and has a different set of characteristics from those of other countries in the world. Apartheid policies and laws like the Group Areas Act produced an unnatural system of urban land use in cities. The Group Areas Act divided South African cities into racial areas (Figure 69). It was illegal for designated groups to live or own land in certain areas. Black people were forcibly removed from their homes into outlying townships. With the democratic elections of 1994 the landscape of the South African cities started to change.

Now all people can reside in any area irrespective of their racial identity.

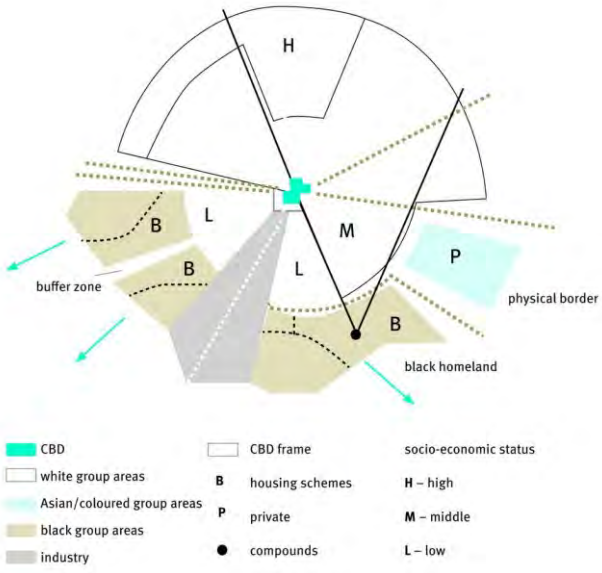


Figure 69 Model of a South African apartheid city

3 Changing urban patterns and land use in South African cities

3.1 Changes in the CBD

As a city's size increases, the CBD grows and becomes progressively differentiated into land use subzones (for instance, retailing, finance, administration, entertainment). Dynamic change in the CBD is constant, through extension, replacement and regeneration. The CBD expands into the surrounding area of old homes and service industries occupying these old homes – the zone of transition. This is known as the principle of invasion and succession.

3.2 Urban retailing

The CBD used to be the most important retail area and most employers favoured this land use zone. In time, the CBD and the suburbs became more divided, resulting in commercial decentralisation. Neighbourhood shopping centres were established in the suburbs. The major forces causing this change were the following:

- increase in urban populations
- the centrifugal expansion of suburbs
- changes in shopping habits and greater mobility.

3.3 Residential changes in South Africa

When buildings in a city are unsuitable for use in the present time, often they are not demolished completely. Instead, the front structure of the building is retained and new structures are built behind the original facade. This allows the old city structure to exist while the building is improved. The process is known as facadism. Sometimes old houses that are close to the city are improved and modernised. This is called gentrification.

Unit 7 Urban settlement issues

1 Recent urbanisation patterns in South Africa

There is a change in the demographic profile of South African cities. Cities attract skilled workers and increasing numbers of the youth who make up most of those who are unskilled, economically inactive and in search of employment. A corresponding change is taking place in rural areas. These areas are mostly former homelands, with limited economic activity. They are characterised by outward migration and a decline in the young population.

The CBDs in South Africa have also seen changes with new shopping centres and altered transport projects, for example the Gautrain and Bus Rapid Transport in big cities. The CBDs have changed because of the decline in the number of people visiting the city centre. Many shops have moved to suburban shopping centres that are further away. People avoid traffic congestion and air pollution.

There also has been competition to use the land on the rural-urban fringe. The main reasons for this are that at the rural-urban fringe land is less expensive, there is less traffic congestion and air pollution, and the environment is relatively unspoilt. In South Africa we have seen a number of office developments and high technology business parks developing on the rural-urban fringe.

2 What are the issues related to rapid urbanisation?

It is very important to plan for the future of urban growth. In South Africa about 60% of the population is urbanised. With rapid ongoing urbanisation and expansion of cities urban areas are experiencing a greater demand for employment, basic services and infrastructure. These problems get worse as the city grows and are often worse in the CBD.

2.1 Lack of planning

Lack of planning can lead to unhindered growth of cities, or urban sprawl. Urban sprawl can occurs when there are no laws to control what and where people can build, such as in South Africa's informal settlements.

2.2 Housing shortages

One of the major challenges that urban municipalities face is providing housing for existing and growing urban populations. The constitution of South Africa says that everyone has the right to have access to adequate housing. Despite having delivered about 220 000 houses a year, South Africa continues to face a major challenge in providing affordable accommodation in sustainable settlements. A shortage of housing means many people have no alternative but to live in informal settlements.

2.3 Overcrowding

Overcrowding is one of the major problems for most urban areas. Urban areas are not ready to accommodate all the people migrating from the rural areas and some from neighbouring countries. Some of the migrants into the cities are not skilled enough to be employed in the formal sector and find it difficult to get employment.

2.4 Traffic congestion

Large cities invariably suffer from congestion on roads. All kinds of conveyances – cars, buses, trams, trucks, trains, motor cycles and bicycles – use the transport network and slow down movement. This is particularly serious during the rush hour.

2.5 Problems with service provision

South African cities face a problem of service provision. The greatest demand for services and infrastructure is mainly at the former low-income residential areas and informal settlements that lack clean drinking water, electricity, healthcare facilities, sanitation, solid waste disposal, housing and safe, reliable and affordable transport systems.

3 Growth of informal settlements and associated issues

A major problem in African cities is the inability of the governments to provide adequate and affordable housing. The majority of residents do not have access to formal housing and related amenities, and generally live in informal settlements without service provision. Informal settlements are not planned therefore lack services.

4 How are urban areas in South Africa managing urban challenges?

Urban settlements in South Africa are not static, they change over time. As South African cities have a history of apartheid, there now is rapid urbanisation and some urban settlements have been planned on new sites. Such cities are called 'new towns'. New towns are urban settlements planned and built to ease the housing shortage in existing towns and cities. New towns include garden cities, edge cities and green belt cities. In these settlements all aspects of development are determined before construction begins. The ultimate aim is to provide not only access to services and amenities, but also to achieve environmental, economic and social justice and individuals and communities.

Questions

Question 1

Provide the best answer to the following multiple choice questions.

1.1 In rural areas the failure of industrialisation and the modernisation of agricultural practices has led to ...

A voluntary resettlement
B rural-urban migration
C basic need philosophy
D formal resettlement
E push-pull factors

1.2 What are the advantages of nucleated rural settlement?

A economic
B political
C can make farming easier
D social
E all of these

1.3 A settlement is classified as rural on the basis of ...

A the distance from a large town
B the number of people living in it
C the main function of its inhabitants
D the size of the settlement
E none of these

1.4 What is the main difference between rural and urban settlements?

A rural settlements are multi-functional while urban settlements are uni-functional
B rural settlements consist of people engaged in primary activities while urban settlements consist of people engaged in secondary and tertiary activities
C urban settlements are larger than rural
D rural settlements are found in the country

1.5 Which of the following is the most important cause of rural depopulation?

A push and pull factors that cause growth in urban areas

B lack of employment chances

C lack of good schooling in the rural areas

D the 'bright lights' of the city life

E less medical care in the rural areas

1.6 Many factors have encouraged rural-urban migration in South Africa. Identify one push and pull factor in this rapid urbanisation process.

A employment opportunities and migrant labour

B squatting and migrant labour

C economic advancement and employment opportunities

D the dislike of the traditional rural life and the 'bright lights' of the city

E none of the alternatives

1.7 What two important events helped urban development?

A the agricultural and industrial revolutions

B urban growth and democratic government

C uneven rural growth and population migrations

D counter-urbanisation and metropolitan expansion

E droughts and lack of birth control in the rural areas

1.8 Which of these statements is true?

A The development of new shopping centres has mainly occurred in the CBD.

B The development of new industry has been in the rural-urban fringe.

C The development of new industry has been in the CBD.

D The development of new industry has been away from major transport links.

E No development occurs in the transition zone.

1.9 In the Burgess' model of urban land use the middle class residential area is located ...

A in the centre

B near the wholesaling and light manufacture

C near the industrial areas

D between the working class and upper class

E in either B or C

1.10 The urban land use model that divides a city into 'slices' radiating out from the CBD is called the ...

A concentric zone model

B bid-rent model

C multiple nuclei model

D sector model

E apartheid model

1.11 What does the term gentrification mean?

A the conversion of lower income neighbourhoods into more upscale communities

B people moving from the inner city to townships located on the edge of the city

C migrating from rural to urban areas

D wealthy middle class people moving into the inner city and redeveloping the housing

E A and D

1.12 When planning for a better environment in a city what two factors need to be taken into consideration?

A traffic and pollution

B rural-urban migration and traffic

C traffic and over-population

D urban expansion and waste disposal

E traffic and the zone of transition

1.13 Improved means of transport have rapidly altered the city. What effects has better transport had on these cities?

A skyscrapers, growth of suburbs, large city populations and pollution

B skyscrapers, multi-centred urban structures, renewal of the city centre

C skyscrapers, increase in population of the city centre, residential segregation

D depopulation of the city centre, post-modern urban centres, residential segregation, decentralisation of functions

E skyscrapers, centripetal forces, depopulation of the city centre

15×2=(26)

Question 2

Provide the best description for each of the terms by matching the columns.

2.1	Bridge point	A	This attracts households and businesses towards the centre of the city
2.2	Central Business District	B	Roads running parallel to each other with others crossing at right angles
2.3	Central place	C	Also called low order goods
2.4	Centrifugal force	D	A basic framework of roads, power, water supplies and schools and hospitals
2.5	Centriptal force	E	A waterway crossing point and important in locating settlements
2.6	Commuter	F	A system of grading the various types of settlement according to size
2.7	Convenience goods	G	A point in a network where routes meet or intersect
2.8	Functions	H	The area between the built up town and countryside
2.9	Green belt	I	Selling good, usually from a shop
2.10	Hierarchy of settlements	J	The minimum number of people in a region required to support a particular shop or service
2.11	Grid pattern	K	A person who travels (often some distance) daily from home to place of work in a large city
2.12	Infrastructure	L	The central part of a town or city, which is likely to contain many offices and business headquarters
2.13	Node	M	This pushes households and businesses away from congested , polluted, high density and expensive inner-city areas
2.14	Retailing	N	The area around a shop, settlement or central place which is affected by the goods and services on offer
2.15	Ribbon development	O	Urban expansion along roads
2.16	Rural-urban fringe	P	Deterioration especially of the older parts of the town
2.17	Sphere of influence	Q	The physical spread of a town in an unplanned, sometimes disorderly manner
2.18	Threshold population	R	Provides goods and services to that rural area
2.19	Urban decay	S	The general appearance and the major landmarks of an urban skyline
2.20	Urban profile	T	The services, amenities and goods available in a settlement
2.21	Urban sprawl	U	An area of rural land surrounding an urban area

21×2=(42)

Question 3

Study Figure 1 showing rural settlement in KwaZulu-Natal and answer the questions that follow.

Figure 1 A rural settlement in KwaZulu-Natal

3.1 State why this settlement is classified as a nucleated rural settlement. 2×2=(4)

3.2 Many of the young men in this area have moved to the cities of Pietermaritzburg and Durban.

3.2.1 State the name of this movement. 1×2=(2)

3.2.2 Describe three push and three pull factors that might have caused the young men to move. 6×2=(12)

3.2.3 Describe three barriers the young men might have met in their move to the city. 3×2=(6)

3.3 There are advantages and disadvantages of living in a nucleated rural settlement.

3.3.1 Describe three social advantages. 3×2=(6)

3.3.2 Describe three economic disadvantages. 3×2=(6)

(36)

Question 4

'There are distinct similarities between remote rural areas and inner cities: a decreased demand for labour, unemployment, low wages, a lack of skills, a decline in services, limited new investment, a high dependency ratio, dereliction, blight and a high cost of public services.'

Write an essay of approximately ONE page in which you evaluate the validity of the statement above. 10×2=(20)

TOTAL MARKS [124]

Answers to Questions

Question 1

1.1	B ✓✓
1.2	E ✓✓
1.3	D ✓✓
1.4	B ✓✓
1.5	B ✓✓
1.6	D ✓✓
1.7	A ✓✓
1.8	A ✓✓
1.9	B ✓✓
1.10	D ✓✓
1.11	D ✓✓
1.12	D ✓✓
1.13	E ✓✓
1.14	A ✓✓
1.15	A ✓✓

15×2=(30)

Question 2

2.1	E ✓✓
2.2	L ✓✓
2.3	R ✓✓
2.4	M ✓✓
2.5	A ✓✓
2.6	K ✓✓
2.7	C ✓✓
2.8	T ✓✓
2.9	U ✓✓
2.10	F ✓✓
2.11	B ✓✓
2.12	D ✓✓
2.13	G ✓✓
2.14	I ✓✓
2.15	O ✓✓
2.16	H ✓✓
2.17	N ✓✓
2.18	J ✓✓
2.19	P ✓✓

2.20 S ✓✓

2.21 Q ✓✓

21×2=(42)

Question 3

3.1 It is rural because the majority of the people are engaged in agriculture. ✓✓ It is nucleated because the houses are all close together. ✓✓ 2×2=(4)

3.2.1 Rural-urban migration ✓✓ 1×2=(2)

3.2.2 Push factors – Three of: mechanisation on farms, poor medical and family planning services, few primary and secondary schools, poor housing, limited socialising opportunities, poor services, poverty, natural hazards, insufficient land. ✓✓ ✓✓ ✓✓ 3×2=(6)

Pull factors – Three of: better career prospects, better medical and family planning facilities, better educational opportunities, better housing, better social life, better shops, transport and communications, higher wages and standards of living, less threat from natural hazards, relations have migrated ✓✓ ✓✓ ✓✓ 3×2=(6)

3.2.3 Three of: costs, dangers, distance, transport, leaving family ✓✓ ✓✓ ✓✓3×2=(6)

3.3.1 Three of: daily social contact, community involvement, people do not live in isolation from one another in time of need, protection is easier when people are together, there are enough people to share the workload, there is a possibility of a co-operative farming system, farmers can agree each to plant a different crop, share the cost of ploughing and fertilising land. ✓✓ ✓✓ ✓✓ 3×2=(6)

3.3.2 Three of: there is no independent decision making, individuals cannot show initiative, fields are scattered, which wastes time, machinery is shared, it is difficult to be economically successful, plots may be too small to be economically viable, modern farming methods cannot be applied effectively. ✓✓ ✓✓ ✓✓ 3×2=(6)

(36)

Question 4

There are many possible answers but you need to show that they have picked up on the similarities between the two areas. Some answers could be:

10 valid points will give full marks

- Both areas are characterised by low income residents. ✓✓
- Residents have a limited education. ✓✓

- They usually have high birth rates. ✓✓
- A high dependency ratio. ✓✓
- Little government investment in these areas. ✓✓
- Services are expensive and sometimes lacking. ✓✓
- Decreased demand for labour and hence unemployment: due to mechanisation and minimum wages (especially in rural areas). ✓✓
- Low wages: due to lack of skills and education due to old apartheid policies. ✓✓
- Lack of skills: due to lack of education and access to facilities. ✓✓
- Decline in services: inaccessibility, high costs. ✓✓
- Limited new investment: often investment is focused on urban areas, many rural areas are still lacking investment. ✓✓
- Dereliction and blight due to large numbers of people per house (especially in the inner cities). ✓✓

Any 10×2=(20)

TOTAL MARKS [128]

Topic 4 Economic geography of South Africa

Unit 1 Structure of the economy

1 What are economic sectors?

1.1 The primary sector

The economy of the country is made up of a number of economic sectors. The primary sector extracts or harvests products from the Earth or the sea. This includes farming, forestry, fishing, mining and quarrying.

1.2 The secondary sector

The secondary sector manufactures finished goods from products produced in the primary sector. All manufacturing, processing and construction lie within the secondary sector. Activities associated with the secondary sector include metal working, engineering, food processing, textile production and the chemical industries.

1.3 The tertiary sector

The tertiary sector of the economy is the service industry sector, providing services to the general population and businesses. Activities associated with this sector include retail and wholesale sales, transportation and distribution, entertainment, restaurants, tourism, insurance, banking, healthcare, and law.

1.4 The quaternary sector

Quaternary sector activities provide information and expertise with an emphasis on information and computer technology. It includes data processing, use of geographical information systems (GIS), consulting and research. It is a very small sector and is often included in the tertiary sector.

1.5 An example of how the sectors are linked

- A farmer produces wool from sheep – primary activity.
- The factory makes the wool into a jersey – secondary activity.

- The factory uses the railways to transport the jerseys to the shop and the shop sells the jersey to a consumer. The shop uses a bank and its premises and stocks are insured. These are all tertiary activities.
- The shop employs a computer company to use a geographic information system (GIS) to determine the range of goods and location of competitors. This is a quaternary activity.

2 What are the economic sectors' contributions to the South African economy?

2.1 The gross domestic product (GDP)

The gross domestic product (GDP) is one of the main indicators used to measure the size of a country's economy. It represents the total value of all goods and services produced over a specific period.

2.2 GDP and development

If a country is highly developed, only a small proportion of the population is employed in the primary sector, considerably more people are active in the secondary sector, while the majority are involved in the tertiary sector. In developing countries the economically active population is engaged mainly in primary activities, while a smaller percentage of the workforce is employed in tertiary and quaternary activities.

2.3 The changing nature of South Africa's economy

Figure 70 shows how South Africa's economy has changed in the last 100 years, from a less economically developed country to one that is now more highly developed. A greater proportion of the economically active population is employed in the tertiary sector, and proportionally fewer people are employed in the primary sector.

Figure 70 The changing percentage contribution of the economic sectors to South Africa's GDP

3 How can we use graphical and statistical information about the economy?

Graphs of employment in various sectors through time (like Figures 70 and 71) can be used to study comparative levels of development and economic growth.

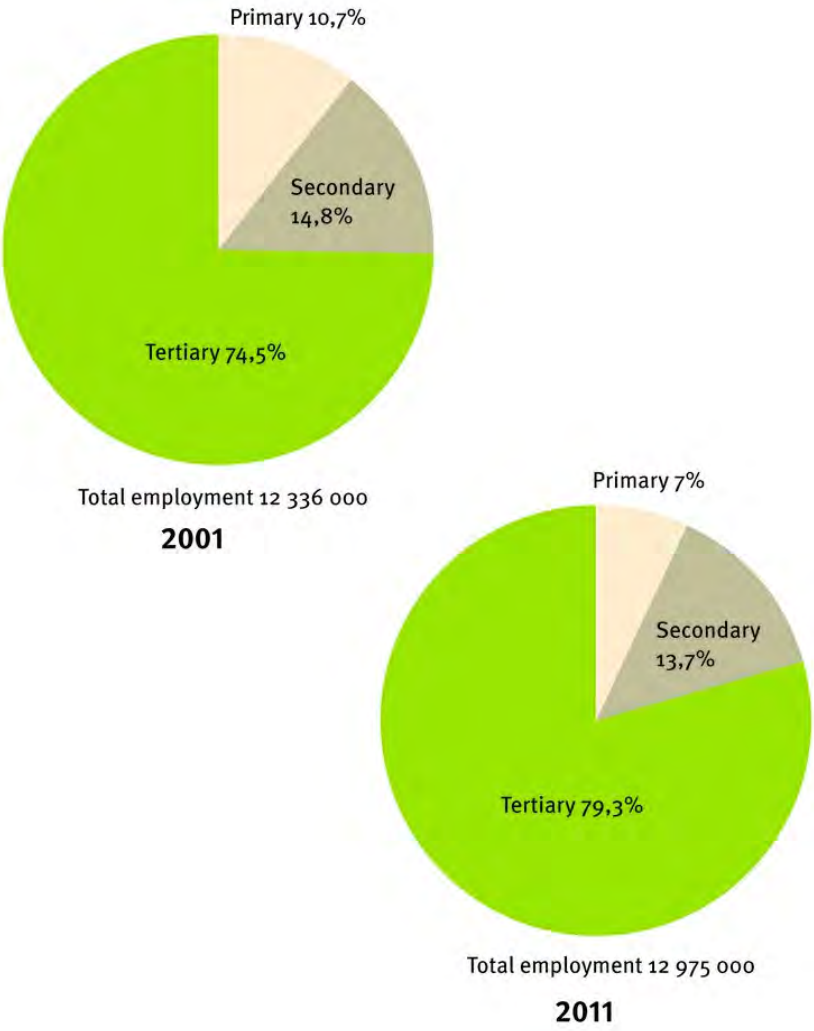


Figure 71 Comparison of employment by sector in the South African economy: 2001 and 2011

Unit 2 Agriculture

1 What is the contribution of agriculture to the South African economy?

Agriculture contributes a small and declining share to South Africa's GDP. Agriculture is an important economic sector because it provides income and food for the population. Agriculture is a significant provider of jobs, especially in the rural areas, and a major earner of foreign exchange. South Africa exports more food than it imports.

The contribution of agriculture to the economy consists mainly of four factors:

- direct contributions to gross domestic product (GDP)
- supply of food to the population
- contributions to the country's balance of trade
- employment of workers.

Figure 70 shows the steady decline of agriculture's contribution to the South Africa's GDP, from 15% in 1955 to 2,4% in 2010. This does not mean that agriculture is decreasing in importance. It means that the other sectors, especially the tertiary sector, are growing faster than the agricultural sector.

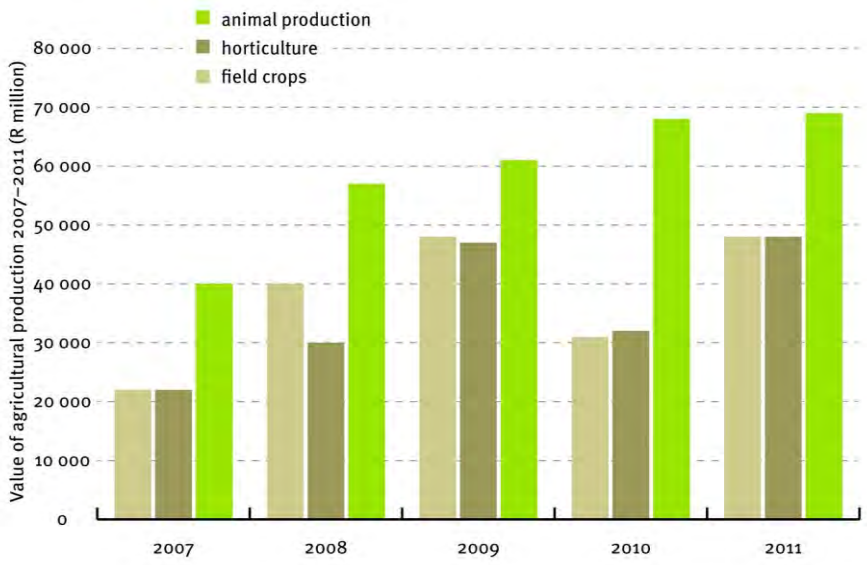


Figure 72 The value of agricultural production: 2007–2011. Field crops are mainly maize and wheat. Horticultural products consist of fruit, vegetables and flowers. Animal products are mainly cattle, sheep and chickens.

1.1 Direct contribution of agriculture to the gross domestic product

In 2011 the contribution of agriculture to the GDP was approximately R64 billion. The agricultural sector has grown by an average of 12% per year since 1970, while the total economy has grown by 15% per year over the same period. This resulted in agriculture's share of the GDP dropping from 8% in 1970 to 2,4% in 2010.

1.2 Supply of food to the population

South Africa is one of the few countries in which agriculture is able to supply enough food for the population, although food prices are rising quickly. South Africa produces more than is needed for domestic consumption.

1.3 Contribution to the country's balance of trade

Normally about 25% of South Africa's field crop production and 34% of horticultural (fruit and vegetables) production is exported. Almost the whole wool clip is exported. About half the exports are in processed form and agricultural exports are about 10% of South Africa's total exports.

1.4 Employment

Employment in agriculture reached its peak in 1971, when 1 639 000 people worked on commercial farms. Since then, like most agricultural countries, in South Africa machines have replaced human labour in many processes. The agricultural employment figure in 2011 dropped to 406 000 – a loss of over 1,2 million workers. The development of more and better machines and larger farms to use them on contributed to this.

2 What are the roles of small-scale and large-scale farmers?

2.1 Large-scale commercial farming

Large-scale farming is the production of crops for sale in retail outlets such as shops. In commercial farming crops such as wheat, maize, sugar cane, fruit, vegetables and meat are sold all over South Africa and on world markets. The main objective of commercial farming is to make a profit.

2.2 Small-scale subsistence farming

Subsistence farming is a form of small-scale farming, usually intensive, in which nearly all of the crops or livestock raised are used to maintain the farmer and the farmer's family, leaving little, if any, surplus for sale. The work is usually done by family members, often women, children and the elderly.

3 What are the main products produced for home and export markets?

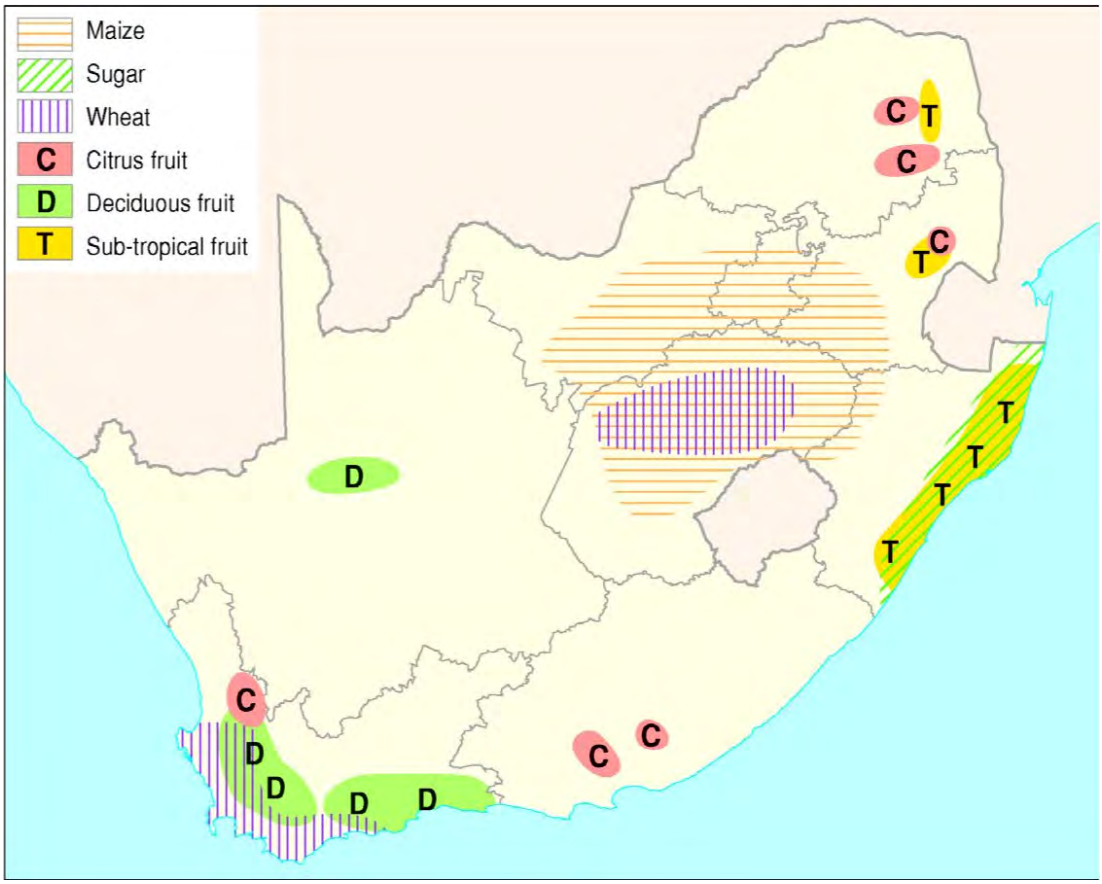


Figure 73 The location of the main crop and fruit producing areas in South Africa

3.1 Maize

Maize is the country's most important crop. It is the basic food for many people, it is used as a livestock feed, and is an important crop for both the home market and the export market. Maize is grown commercially on many farms, mainly in North-West, Mpumalanga, Free State and KwaZulu-Natal, where there is summer rainfall of at least 500 mm per annum.

3.1.1 The importance of maize to South Africa

- Maize is an important part of the South African diet.
- Maize is also eaten indirectly through its use as an animal feed in chicken, cattle and pig farming.
- It is used in the production of food products such as beer, cheese spreads, instant coffee and many others.
- It provides direct employment to about 20 000 people and their families.
- It consumes products from other industries, such as fertiliser, irrigation equipment, herbicides, fuel and farm implements.
- It earns valuable foreign exchange.
- It provides the staple starch for millions of people depending on subsistence farming.

3.1.2 Trade balance

The quantity of maize produced varies from year to year. In good years maize is exported. It is imported in years when the rainfall is low.

3.2 Wheat

South Africa's annual wheat production has remained more or less steady since the 1970s, ranging from about 1,5 to 2 million tons. The winter rainfall areas of the Western Cape and the eastern Free State with late summer and early summer rainfall produce nearly all of South Africa's wheat. Most of the wheat is grown on highly mechanised, large-scale, commercial farms.

3.2.1 The importance of wheat to South Africa.

As urbanisation increases bread consumption rises. Migrants to the city cannot grow maize as they can in the rural areas and bread takes the place of maize in the city. All our bread and pasta is made from wheat, so it is a very important crop. Wheat farmers employ about 25 000 workers and buy fuel, fertiliser, machinery and seed. Recently South Africa has been importing wheat.

3.3 Sugar cane

Sugar cane is grown by 35 300 large-scale and small-scale farmers in the wetter areas of KwaZulu-Natal and southern Mpumalanga lowveld. More than 33 000 are small scale growers producing nearly 10% of the total crop. With the growth of economic development and empowerment of previously disadvantaged people, the participation of black farmers in sugar cane production is increasing constantly.

3.3.1 Exports

Sugar is a major export crop. No sugar is imported and the value of exports is about R1–2 billion annually.

3.4 Fruit

Fruit is grown all over South Africa where there is enough rainfall or irrigation water is available. South Africa is the third largest exporter of oranges after Spain and the USA.

- Sub-tropical fruit such as bananas, mangoes and avocado pears are grown in the warmer regions of KwaZulu-Natal, Mpumalanga and Limpopo.
- Citrus fruit such as oranges and grapefruit are important in the Western Cape, Eastern Cape and Limpopo.
- Deciduous fruits such as apples, peaches and grapes are grown all over the country but mainly in the Western Cape.

3.5 Animal products

Poultry, mainly chickens, is our largest single agricultural product. They are reared near all the main towns. Sheep, for wool and mutton, are kept in the drier, western half of the country. Beef cattle are ranched in the better-watered eastern parts of South Africa. Dairy cattle are reared near the main urban centres.

3.6 Import and export of agricultural products

Table 17 shows our main agricultural imports and exports.

Table 17 South African imports and exports of agricultural products – 2011

Exports	Imports
Citrus fruit – R7 000 million	Wheat – R4 300 million
Maize – R6 000 million	Rice – R3 700 million
Wine – R5 500 million	Palm oil – R3 000 million
Grapes – R3 400 million	Poultry meat – R2 700 million
Apples – R3 000 million	Soya bean oil – R2700 million
Total exports R50 000 million	Total imports R45 000 million

4 What are the factors that favour and hinder agriculture in South Africa?

4.1 Favourable factors

- **Climate:** South Africa has a range of climates making it possible for many different crops to be grown.
- **Trade:** Trade with other countries has benefited our farmers.
- **Tradition:** There has been a long tradition of agriculture in South Africa and some of our farmers are amongst the best in the world.
- **Land ownership:** Most of our commercial farmers own their land, which makes it easy for them to get agricultural development.

4.2 Hindering factors

- **Climate:** Three-quarters of South Africa has below 500 mm of rainfall annually. This is the minimum for successful crop growing.
- **Soils:** Many of South Africa's soils are infertile and large parts of the country are too steep for crop growing. South Africa has one of the worst soil erosion problems in the world.
- **Trade:** Many countries including USA, China and European Union countries subsidise production of their farm products making it too expensive to sell food to these countries.
- **Land ownership:** Apartheid laws meant that black people were not allowed to own farms in most of the productive areas. This is only slowly being reversed.

5 The importance of food security in South Africa

Food security exists when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life. Access to food is vital since it is essential to well-being and human development.

5.1 Factors influencing food security

- **Droughts and floods:** Adverse weather raises the price of food in the shops for all consumers, but the poor, at or below the poverty line, are the most affected.
- **Economic problems:** South Africa has struggled to create job opportunities to allow people to live above the poverty line.

- **Mismanagement and poor governance:** Money that should go towards job creation and agricultural development often has been stolen by corrupt people.
- **HIV and Aids:** This is of concern because of the negative effects on the people involved in agricultural production.
- **Poverty:** People without money cannot buy food.
  Population growth: More people means less land to grow food on and existing land is over-utilised.

Unit 3 Mining

1 What is the contribution of mining to the South African economy?

South Africa is the world's biggest producer of platinum, and one of the leading producers of gold, diamonds, base metals and coal. South Africa holds the world's largest natural reserves of gold, platinum-group metals (or pgms), chrome and manganese, and the second-largest reserves of zirconium, vanadium and titanium.

Even though the relative contribution of mining to South Africa's gross domestic product has declined over the past 20 years mining remains a cornerstone of the economy. This can be seen in Figure 74.

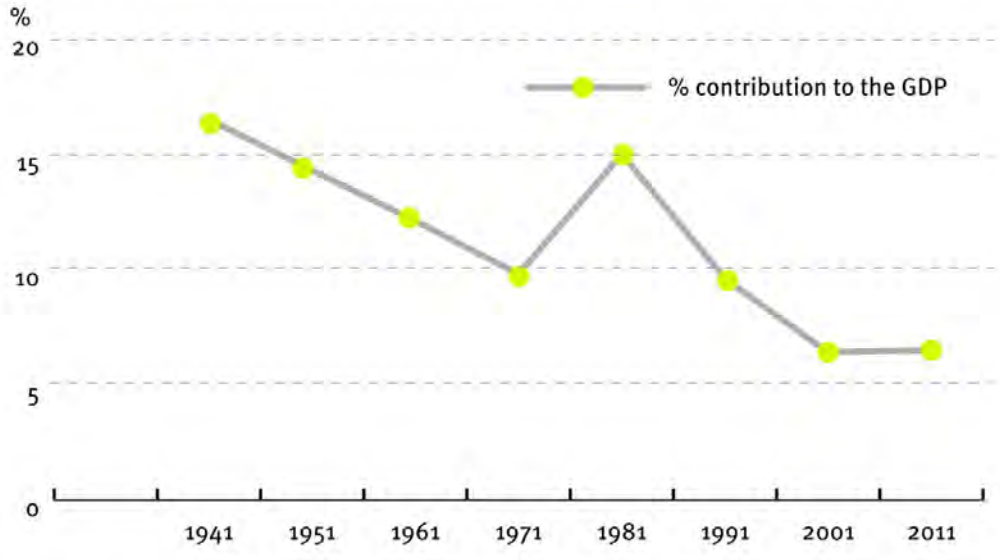


Figure 74 The percentage contribution of mining to the GDP 1941–2011

2 What is the significance of mining to the development of South Africa?

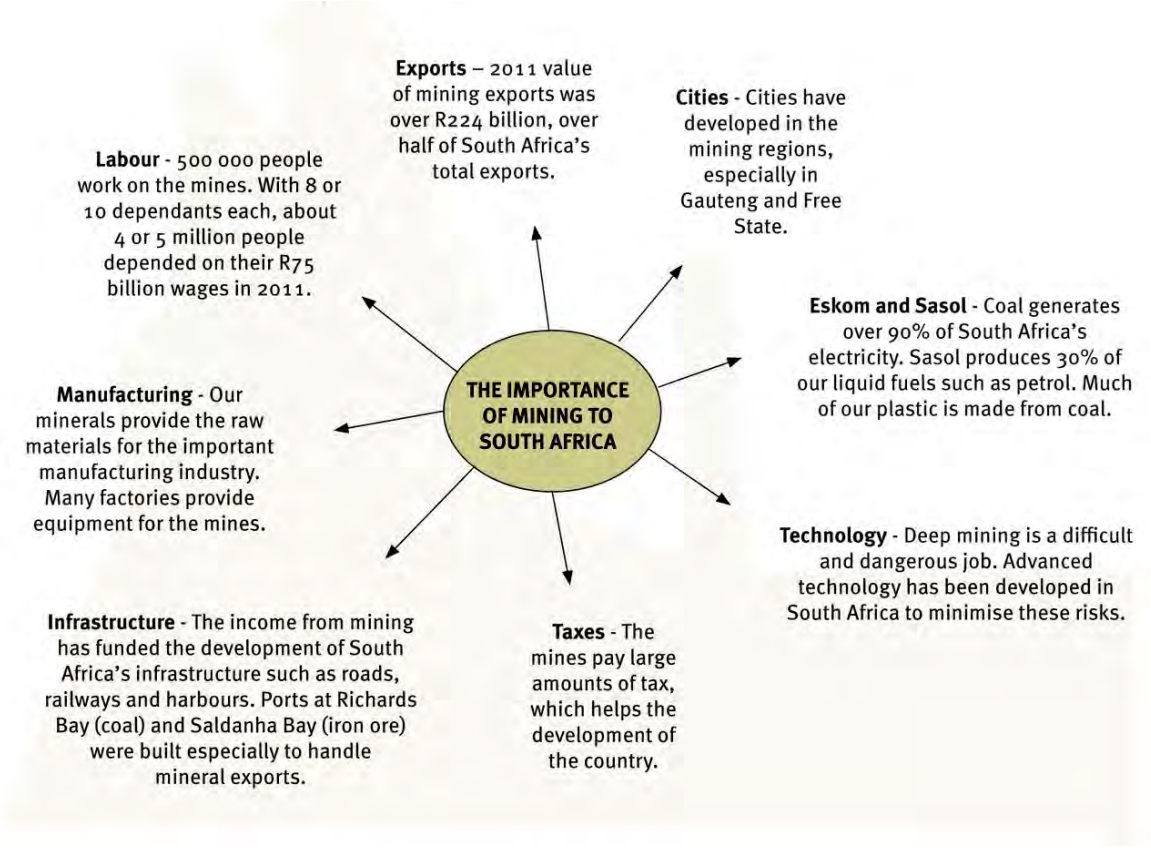


Figure 75 Mining has contributed hugely to the growth of South Africa and remains a very important contributor to employment and the economy.

3 What are the factors that favour and hinder mining in South Africa?

3.1 Factors favouring mining

- **Power:** The discovery of coal in Mpumalanga near the gold fields made cheap electricity available for the nearby mines.
- **Labour:** There are many unskilled and semi-skilled workers in South Africa.
- **Technology:** South African mines are some of the most technologically advanced in the world.
- **Raw materials:** South Africa has a wide range of minerals and is the world's leading producer of platinum, chrome and manganese.

- **Infrastructure:** An advanced network of roads, railways and harbours services the mines.
- **Government:** The government has always encouraged mining and is now assisting small-scale independent and previously disadvantaged miners.
- **Markets:** There are ready markets for our minerals both in South Africa and overseas.

3.2 Factors hindering mining

- **Distances:** Many of our minerals are found far from the coast.
- **Dependence on foreign markets:** 85% of our minerals are exported and thus we are dependent on foreign governments and companies for sales.
- **Water:** Water is a problem in a number of ways. Underground water is expensive to remove. The mines use a lot of water in the mining operation and in processing.
- **Acid mine drainage:** This is the flow of polluted water from old mining areas.
- **Pollution:** Apart from the pollution of water, mines often pollute the environment with dust and visually in the form of mine dumps.
- **Climate:** Some mining areas, such as those in the Northern Cape have very hot climates, making life uncomfortable.
- **Fluctuating market prices:** With recent low prices some mines have had to close.

Unit 4 Secondary and tertiary sectors

1 What is the contribution of the secondary and tertiary sectors to the South African economy?

Since the early 1990s the country's economic growth has been driven mainly by the tertiary sector. In this period the tertiary sector's share of the GDP rose from 55% to its present 77% while that of manufacturing dropped from 28% to the present 14%.

2.1 Heavy industry

Heavy industry is the large-scale production of goods sold to other industrial customers rather than to the end consumer. Examples of heavy industry include chemicals, steel manufacture, oil refining.

2.2 Light industry

Light industry needs less capital than heavy industry. It is produced for the end user rather than for other industries. Examples of light industries include the manufacture of clothes and furniture.

2.3 Raw material oriented industries

Raw materials are the materials used to make a finished product. Where the raw materials are bulky or difficult to transport the raw material orientated industries must be located near the source of the raw material.

2.4 Market oriented industries

Market orientated industries produce goods that must be produced near the consumer.

2.5 Footloose industries

Footloose industries have a free choice of location.

2.6 Ubiquitous industries

Ubiquitous industries are not tied to specific sources of raw materials or specific markets. They are located everywhere.

2.7 Bridge industries or break of bulk point industries

Bridge industries, also called break of bulk point industries, transfer cargo to smaller units of transport. A bridge industry also occurs when imported raw material can be unloaded directly into the processing plant without further transport costs.

3 What are the factors influencing industrial development in South Africa

3.1 Energy

Factories need electricity and some factories have an agreement with ESKOM to buy electricity cheaply. Examples are the aluminium refineries in Richards Bay, each of which uses as much electricity as a large city.

3.2 Raw materials

South Africa has large quantities of primary industrial raw materials (like iron, coal, chrome, manganese, copper) while agriculture, forestry and fishing provide other important raw materials.

3.3 Labour supply

Labour supply is necessary for industry. Industries producing specialised goods tend to be located where skilled labour is concentrated.

3.4 Transport infrastructure

An efficient transport infrastructure is necessary for bringing in raw materials and distributing manufactured products. South Africa has a good network of roads, harbours and railways to support industry.

3.5 Political intervention

Political intervention in the form of government decisions has a major impact on factory location. The introduction of Industrial Development Zones (IDZs) and Spatial Development Initiatives (SDIs) has encouraged industries to develop in certain areas.

3.6 Competition and trade

Compared with the large markets of Europe and Asia, South African markets are small. The competition from firms in these areas, especially China means items such shoes and clothing can be sold at a lower price than they cost to make in South Africa.

4 South Africa's industrial regions

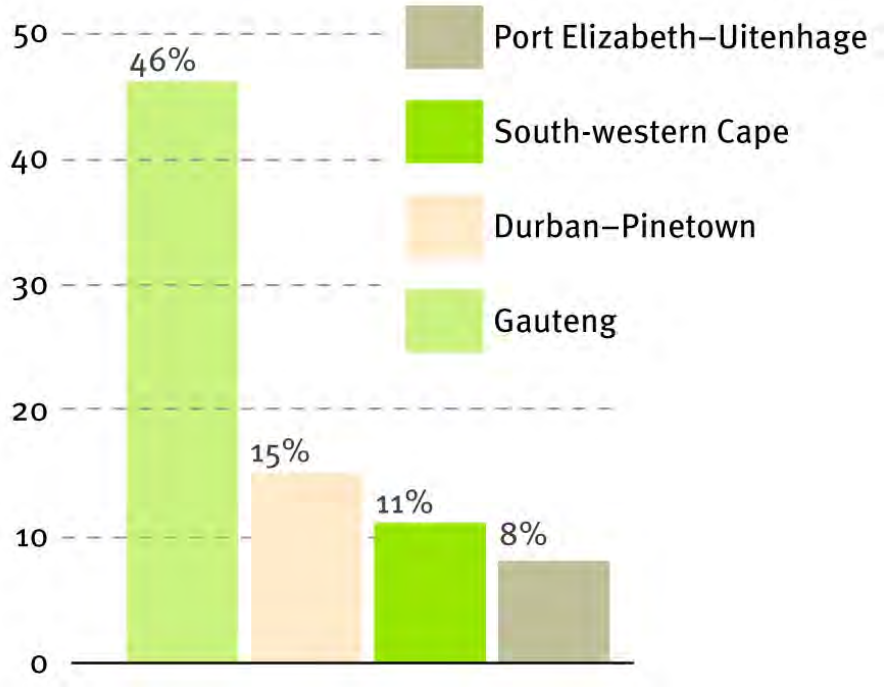


Figure 76 Percentage of industrial output of the main industrial regions of South Africa. The remaining 20% is located in other cities and towns of South Africa.

4.1 Manufacturing in Gauteng

The area extending from Pretoria to Sasolburg and from Brakpan to Randfontein, also known as the PWV, is Africa's most important industrial region.

Figure 77 The PWV in Gauteng is Africa's most important industrial area.

4.1.1 The factors influencing the location of industry

- **Raw materials:** Gold provided the initial stimulus for development of industry and industries arose to provide the mines with mining equipment. Other minerals and agricultural products all stimulate industrial growth.
- **Labour supply:** With jobs available in the manufacturing sector people from all over the world came to the area.
- **Markets:** Gauteng has the highest per capita GDP in South Africa and provides a large market for industrial products.
- **Power:** The huge power stations of Mpumalanga are close by.
- **Transport:** Gauteng is very well-served with road, rail and air links. The big disadvantage is that it has no port.
- **Political intervention:** The Gauteng Economic Development Agency (GEDA) has been developed by the Gauteng government to promote economic growth and development.

4.1.2 Factors limiting industrial expansion

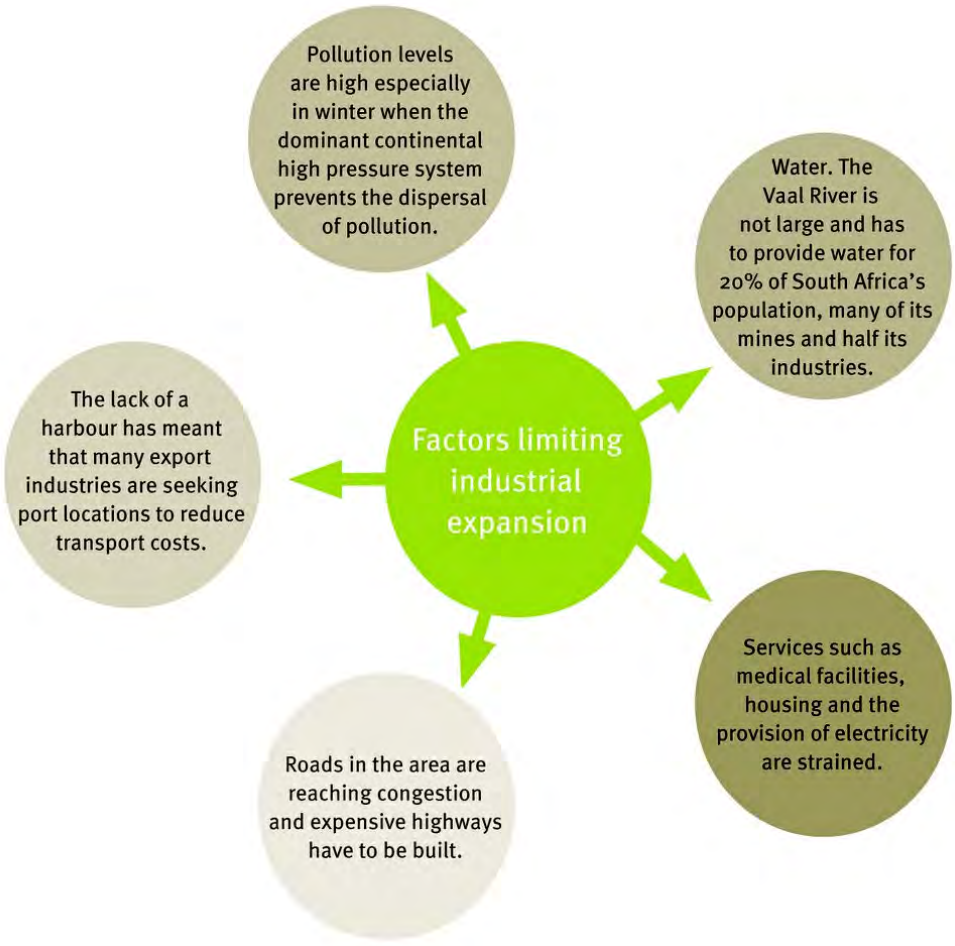


Figure 78 Factors limiting industrial expansion in Gauteng

4.1.3 Main industrial activities

Gauteng is the main centre of South Africa's industrial activity. The region produces a wide range of products such as iron and steel, metal products, food, machinery, electrical appliances, vehicle parts and accessories and chemicals.

4.2 Manufacturing in the Durban–Pinetown area

This area is the second most important industrial area in South Africa.

4.2.1 The factors influencing the location of industry

Durban's harbour is the busiest in the country. The population of greater Durban is over 3,5 million which supplies labour and markets. With its high rainfall the area has many agricultural raw materials, especially sugar and timber. Apart from the port, the area is well-served by road, rail and air.

4.2.2 Main industrial activities

Durban has a wide range of industries. Because of its harbour location many are break of bulk. Food processing is one of the oldest industries. Sugar refining and timber processing are also important. The Toyota motor assembly plant employs 8 000 people and produces over 200 000 vehicles per year.

4.3 Manufacturing in the South-western Cape

The southern part of Western Cape is South Africa's oldest industrial area and produces a wide variety of goods, especially food products and textiles.

4.3.1 The factors influencing the location of industry

Cape Town was the first European-style city in South Africa and industry grew to meet the demands of its inhabitants. These industries have remained there even though other factors suggest that for some of them a new location would be beneficial. This reluctance to move is due to industrial inertia. The region has over 3,5 million inhabitants and their skill levels are among the highest in South Africa

4.3.2 Main industrial activities

- Fruit is processed into canned fruit, fruit juices and wines in Cape Town and the surrounding small towns.
- The largest manufacturing industry in the province is the clothing and textile industry. This is presently declining in importance, due to competition from cheaper Eastern producers, such as China and Vietnam.
- The cold waters of the Benguela current provide food for the abundance of fish in

the sea around the Western Cape. The fish are canned and packed in Cape Town and in the many small towns along the Western Cape coast.
- High-tech industries are growing in importance and are taking the place of the declining textile and clothing industry.
- Iron and steel are important products. Saldanha Bay, 100 km north of Cape Town, is the terminus of the railway line that carries iron and manganese from Sishen in Northern Cape. A steel manufacturing plant has been built at Saldanha Bay.

4.4 Manufacturing in the Port Elizabeth–Uitenhage area

This is the smallest of South Africa's main industrial regions, with 8% of South Africa's industrial output. It is known for the production of motor vehicles and the associated industries.

4.4.1 The factors influencing the location of industry

The port location has been the main attraction for industries in this area. The new deep water port at Coega, 20 km north of Port Elizabeth, will encourage further development in the area. The area has many agricultural raw materials.

4.4.2 Factors limiting industrial expansion

The supply of water is a problem and additional water is obtained from the Orange River via the Orange–Fish–Sundays link tunnels and canals. The lack of minerals in the hinterland is another limiting factor.

4.4.3 Main industrial activities

Textiles and leather goods: These are made using leather from the cattle and wool from the sheep in the hinterland.

Motor vehicles: General Motors and Ford started assembling motor cars at Port Elizabeth nearly 90 years ago. Volkswagen built an assembly plant at Uitenhage in 1947. The area was chosen for its centrally located port so the finished vehicles made from imported parts could be sent easily to the rest of the country. Most other industries in the area provide accessories such as tyres, batteries and windscreens.

Unit 5 Strategies for industrial development

1 Apartheid and post-apartheid industrial development strategies

1.1 Apartheid strategy – border industries

The policy of apartheid meant that South Africa was to be a 'white' republic in which black people did not feature as citizens. This 'bantustan' policy sought to place all black Africans in a 'homeland' according to their ethnic identity. Ten homelands were created (Figure 79).

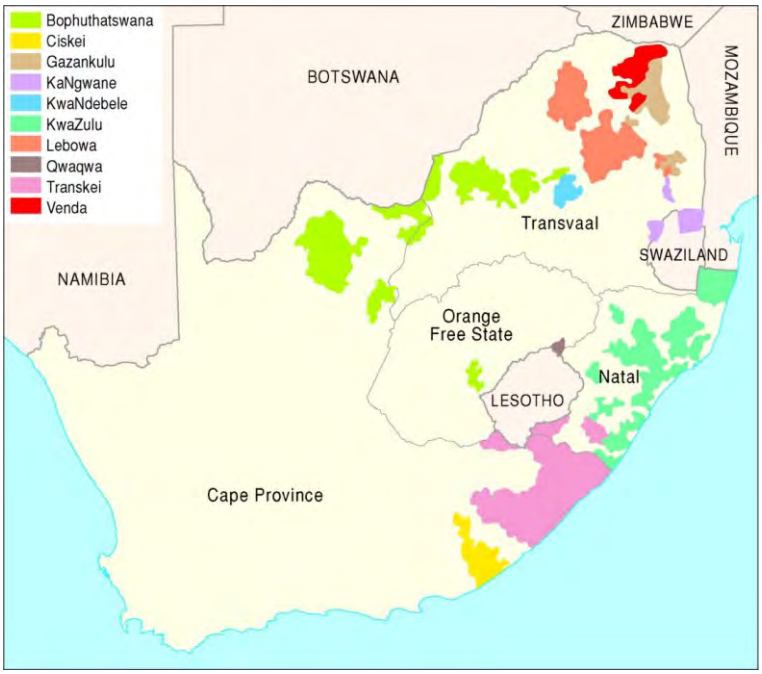


Figure 79 The former 'homelands' in South Africa. Note the different provinces.

These homelands had very few job opportunities and the concept of border industries was introduced. Incentives were offered in order to encourage industrialists to invest in growth points which bordered the homelands. These incentives included tax concessions, labour concessions, transport subsidies and tariff protection. The aim of all these measures was clear: to halt, or even reverse the flow of black Africans to the 'white' areas.

1.2 Post-apartheid industrial development strategies

There have been a number of strategies aimed at economic, political and social development through post-apartheid industrial development. The aim is to develop less developed areas. The main industrial initiatives are the Spatial Development Initiatives (SDIs) and Industrial Development Zones (IDZs).

1.2.1 Growth, Employment and Redistribution (GEAR)

GEAR was a large scale strategy aimed at creating a fast-growing economy and sufficient jobs.

1.2.2 Black Economic Empowerment (BEE)

In the years before democracy in 1994, the apartheid government excluded black people from meaningful participation in the economy. BEE was introduced to rectify the wrongs of the past while helping to bring the black majority into the economy.

1.2.3 Accelerated and Shared Growth in South Africa (Asgi-SA)

Asgi-SA was introduced to achieve economic growth and to halve poverty and unemployment by 2014.

2 What are Industrial Development Zones (IDZs)?

An Industrial Development Zone (or IDZ) is an industrial estate linked to an international sea or air port that encourages export oriented manufacturing industries. They aim to promote the manufacturing sector and to encourage beneficiation of local resources.

3 What are Spatial Development Initiatives (SDIs)?

A Spatial Development Initiative (or SDI) aims to promote growth in those parts of South Africa that are underdeveloped but have potential for growth. The most successful SDI has been the Maputo Corridor. This is a major trade corridor connecting Gauteng and Mpumalanga with Maputo in Mozambique. One hundred and thirty investment opportunities have been identified in the infrastructure, agriculture, mining, energy, chemicals, tourism and manufacturing sectors.

4 What are the issues associated with industrial centralisation and decentralisation

4.1 Centralisation

If an industry is successful in an area its success will attract other forms of economic development and create jobs, services and wealth leading to the centralisation of industry in a few areas.

The advantages of centralisation are that factories use the same physical infrastructure such as power, water and transport. Skilled labour, markets and financial services are all in the same area. This can lead to problems, as shown in Figure 80.

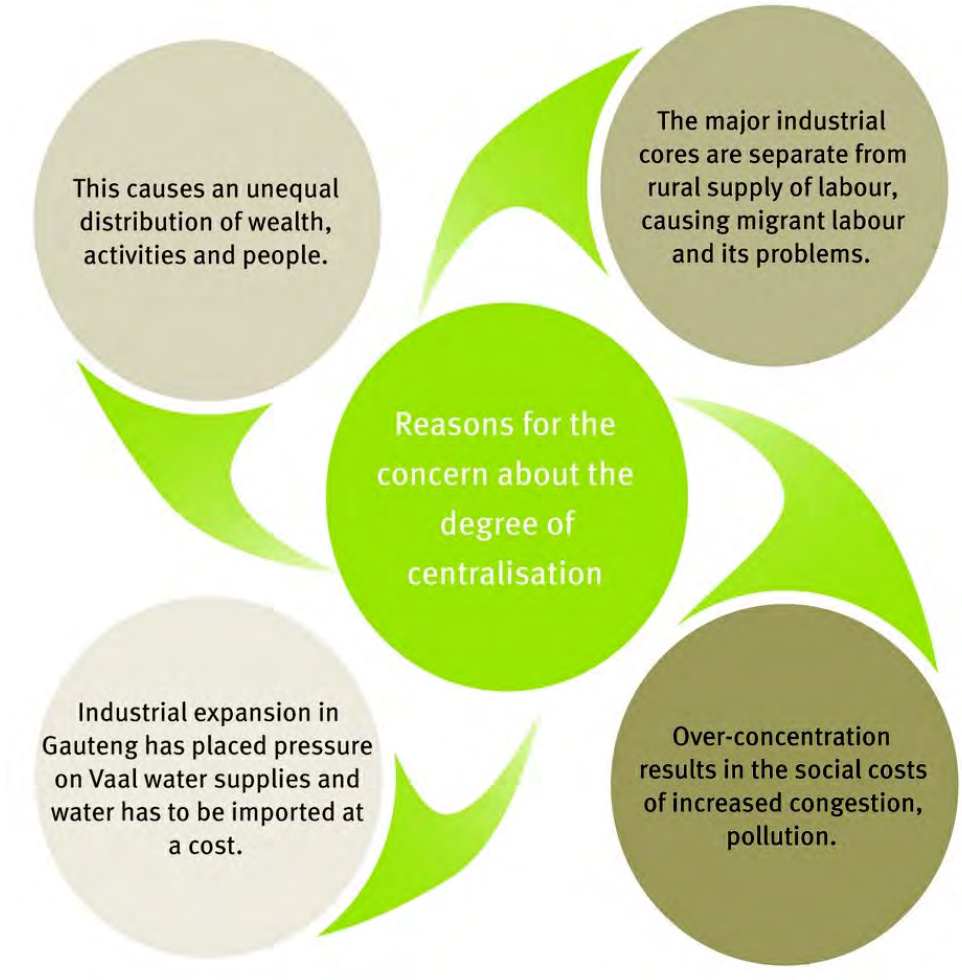


Figure 80 Reasons for concern about centralisation

Unit 6 The informal sector

1 The concept and characteristics of informal sector employment

1.1 What is the concept of the informal sector?

The informal sector refers to that part of an economy that is not taxed and is out of official government records. Workers have no employment contracts and do not belong to trade unions.

1.2 What are the characteristics of the informal sector?

The characteristics of the informal sector are summarised in Figure 81.

Figure 81 The characteristics of the informal sector

2 What are the reasons for high informal sector employment in South Africa?

The number of people involved in the informal sector is estimated to be about 3 million out of a labour force of about 13 million and growing at about 8% per year. This is large in a country like South Africa with a well-established economy.

- Under apartheid black people were denied entry to much of the economy except as unskilled or semi-skilled labourers. Many were unable to obtain a decent education.
- With high unemployment more people have to obtain work in the informal sector in order to survive. As unemployment increases so does the informal sector.
- Many of South Africa's informal sector jobs are carried by non-South Africans, especially Zimbabweans, as they are often denied access to formal employment.

3 What are the challenges facing South Africa's informal sector?

- Traders do not have access to proper trading facilities.
- Traders and their goods are exposed to the weather.
- Traders are frequently harassed by local authorities.
- Banks do not like to give loans to informal traders.
- The sector is unpredictable and the income unreliable.
- There is little time or incentive to improve their education or training.
- Many have HIV/Aids and as the illness gets worse work becomes increasingly difficult.

Questions

Question 1

True or False. State if each of the following statements is true or false. If it is false rewrite the statement correctly.

1.1 Mining iron is a secondary economic activity.

1.2 Banking is part of the tertiary sector.

1.3 The gross domestic product measure the employment structure of a country.

1.4 A country with a large percentage of its labour force engaged in agriculture is the sign of a developed country.

1.5 In 2010 South Africa grew more food than it did in 1980.

1.6 In 2010 fewer people were engaged in agriculture that in 1980.

1.7 South Africa imports more food than it exports.

1.8 Small-scale farming cannot be commercial farming.

1.9 The inputs on a commercial farm include machinery and paid labour.

1.10 Wheat grown in South Africa is an important export crop.

1.11 Free State is an important producer of wheat, maize and sugar.

1.12 Maize is an important commercial and subsistence crop.

1.13 Fruit is South Africa's largest export agricultural product.

1.14 Food security exists 'when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life'.

1.15 The discovery of gold and platinum in the 1890s led to the early development of South Africa's industry.

1.16 Most of South Africa's electricity is generated in Gauteng.

1.17 Footloose industries manufacture most of South Africa's shoes.

1.18 Spatial Development Zones were established to develop economic activity in underutilised areas with economic potential.

1.19 Maputo is the closest harbour to the Gauteng industrial region.

1.20 Nuclear power is generated at a power station in Western Cape.

20×2=(40)

Question 2

2.1 Refer to Figure 1 which shows an example of economic activities linked to the informal sector.

Figure 1

2.1.1 Explain why the activities in Figure 1 are classified as being part of the informal sector. 2×2=(4)

2.1.2 Give four characteristics of labour in the informal sector. 4×2=(8)

2.1.3 Give three problems that informal traders like those in Figure 1 experience. 3×2=(6)

2.2 Informal economic activities make no direct contribution to the Gross Domestic Product of a country.

2.2.1 What is meant by the term GDP? 1×2=(2)

2.2.2 Explain why the statement in 1.6 in question 1 above is true. 2×2=(4)

2.3 Give two advantages of the informal sector for a country's economic development. 2×2=(4)

2.4 Give two disadvantages of the informal sector for a country's economic development. 2×2=(4)

(32)

Question 3

Study Table 1 below and then answer the questions that follow.

Table 1 The contributions made by some sectors of the economy to the GDP - 2011	
Agriculture, forestry and fishing	3%
Mining and quarrying	7%
Manufacturing	19%
Electricity	2%
Finance, real estate, business services	22%
Construction	3%
Internet	2%
Wholesale and retail trade	13%
Social and personal services	20%
Transport	9%

3.1 Which of the four economic sectors contributed most to South Africa's GDP? 1×2=(2)

3.2 State the contribution made by the primary sector to the GDP. 1×2=(2)

3.3 Classify the following economic sectors from the table as primary, secondary, tertiary or quaternary:

3.3.1 Social and personal services

3.3.2 Manufacturing

3.3.3 Internet 3×2=(6)

3.4 Manufacturing makes up 19% of South Africa's GDP and nearly half this is in Gauteng.

3.4.1 Examine three factors favouring manufacturing in Gauteng. 3×4=(12)

3.4.2 Describe three environmental and social problems resulting from the centralisation of manufacturing in Gauteng. 3×4=(12)

(34)

TOTAL MARKS [106]

Answers to Questions

Question 1

1.1 False. It is a primary activity. ✓✓

1.2 True. ✓✓

1.3 False. It measure the value of all goods and services in a country. ✓✓

1.4 False. It is the sign of a less developed country. ✓✓

1.5 True. ✓✓

1.6 True. ✓✓

1.7 False. It exports more than it imports. ✓✓

1.8 False. It can be commercial farming. ✓✓

1.9 True. ✓✓

1.10 False. Very little wheat is exported. Much more is imported. ✓✓

1.11 False. Wheat and maize are important in Free State but no sugar is grown. ✓✓

1.12 True ✓✓

1.13 True ✓✓

1.14 True ✓✓

1.15 False. Platinum had nothing to do with South Africa's early industrial development. ✓✓

1.16 False. It is generated in Mpumalanga. ✓✓

1.17 False. Footloose industries have a free choice of location, and can move strategically. ✓✓

1.18 True. ✓✓

1.19 True. ✓✓

1.20 True. ✓✓ 20×2=(40)

Question 2

2.1.1 Two of: They don't have formal premises. They are trying to survive in a poor situation. They don't have to pay taxes. They are on the pavement/side of the road. ✓✓ ✓✓ 2×2=(4)

2.1.2 Four of: Low level of skills, low level of education, low level of productivity, small scale operations, variable and irregular income, individually owned. There is little time or incentive to improve their education or training. Many have HIV/Aids and as the illness gets worse work become increasingly difficult. Unsafe and unhealthy working conditions, not a member of a trade union. ✓✓ ✓✓ ✓✓ ✓✓ 4×2=(8)

2.1.3 Three of: Exposed to the weather, subject to xenophobia, goods confiscated by authorities, theft, against the law, unprotected. ✓✓ ✓✓ ✓✓ 3×2=(6)

2.2.1 The total value of a country's output in a year. ✓✓ (2)

2.2.2 Informal traders are in the formal sector, no records of their sales are kept and so they pay no tax, ✓✓ and are not incorporated into the GDP. ✓✓ 2×2=(4)

2.3 Two of: Provides a living for many people, even though they pay no tax they money they earn circulated through the economy, the money they earn is spent on goods and services. ✓✓ ✓✓ 2×2=(4)

2.4 Two of: Do not contribute to the tax base, take business away from formal traders who do pay tax, do not buy property. ✓✓ ✓✓ 2×2=(4)

(32)

Question 3

3.1 Tertiary ✓✓ (2)

3.2 10% ✓✓ (2)

3.3.1 Tertiary ✓✓

3.3.2 Secondary ✓✓

3.3.3 Quaternary ✓✓ 3×2=(6)

3.4.1 Three of, with discussion: Labour, markets, electricity, transport, infrastructure, raw materials, water, capital. 3×✓✓✓✓ 3×4= (12)

3.4.2 Three of, with discussion: Air pollution, water pollution, congestion, overcrowding, time delays, traffic jams, land shortage, high cost of living, crime, stress, ill-health. 3×✓✓✓✓ 3×4=(12)

(34)

TOTAL MARKS [106]

Final Exam Paper 1

TIME 3 HOURS

ANSWER ANY THREE QUESTIONS

SECTION A: PHYSICAL GEOGRAPHY

QUESTION 1

1.1 Match the columns so the description in the left column matches the concept in the right column.

1.1.1	Causes mid-latitude cyclones to move from west to east	A	Trough
1.1.2	Surface of contact between the cold air and the warm westerlies	B	Aspect
1.1.3	An elongated low pressure cell	C	Rejuvenation
1.1.4	Refers to the direction in which a slope faces in relation to the Sun's rays	D	Polar front
1.1.5	A type of erosion which occurs at the source of a stream	E	Headward erosion
1.1.6	A break in the slope of a river	F	Knickpoint
1.1.7	A river has extra erosive power	G	Antecedent drainage
1.1.8	Can cause severe flooding	H	Westerlies
		I	Tropical cyclone

7×2=(14)

1.2 Study the synoptic map below and answer the following questions.

1.2.1 Name the high pressure systems A and B. 2×2=(4)

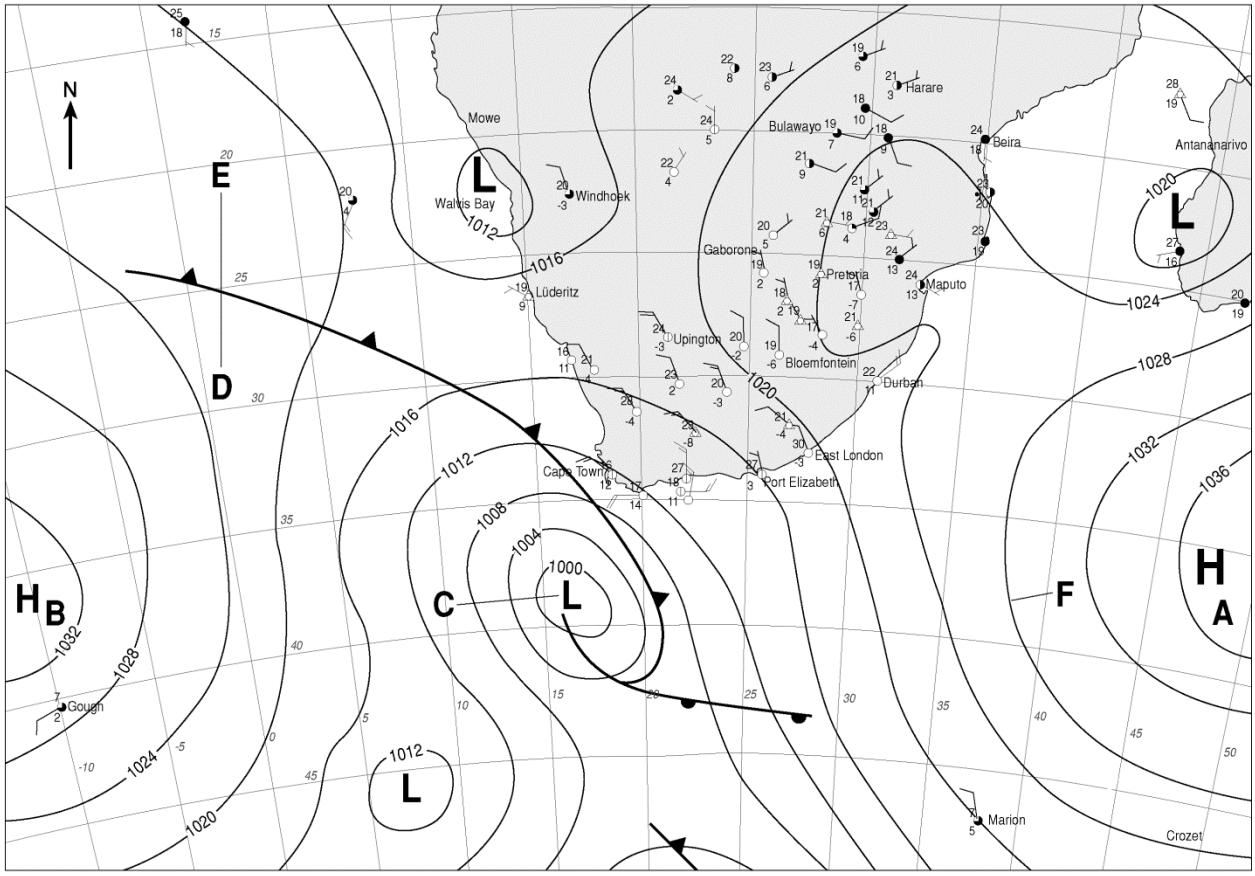
1.2.2 Identify the climatic feature with low pressure at C. (2)

1.2.3 Name the line marked F and state its pressure in hPa. 2×2=(4)

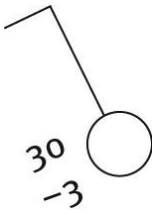
1.2.4 In which pressure system is the highest pressure on the map? (1)

1.2.5 What season does this synoptic weather map represent? (2)

1.2.6 Give three reasons for your answer based on evidence visible on the synoptic weather map. 3×2=(6)



1.2.7 Refer to the station model of Port Elizabeth below and name the type of wind (not direction) that has resulted in the conditions as indicated by the station model. (2)



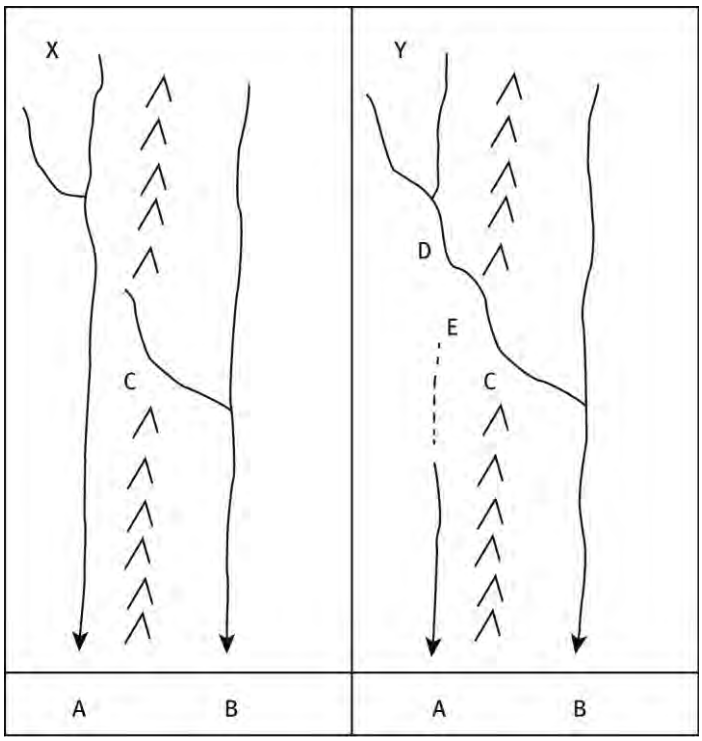
1.2.8 Account for the atmospheric conditions being experienced in Port Elizabeth. 4×2=(8)

(29)

1.3 Geomorphology – Fluvial processes

1.3.1 Explain the difference between the terms abstraction and headward erosion. 2×2=(4)

1.3.2 Abstraction and headward erosion can lead to river capture. Explain what is meant by the term river capture. 2×2=(4)



1.3.3 Provide labels for the characteristic features A to E shown on map Y in the diagram above. 5×2=(10)

1.3.4 Describe the steps in the process that led to the landscape in map Y. 3×2=(6)

1.3.5 Explain why River B in map Y has been rejuvenated. 1×2=(2)

1.3.6 List two landforms that could result from this rejuvenation. 2×2=(4)

(30)

[75]

QUESTION 2

2.1 Multiple choice. Indicate the best answer for each of the following questions.

Table 1 below shows temperatures on two consecutive July days at 06:00 on a farm in the Drakensberg mountains of KwaZulu-Natal.

Table 1 Temperatures on two consecutive July days at 06:00 on a farm in the Drakensberg

		Temperatures	
	Height	First day	Second day
Place X	800 m	-5 °C	-6 °C
Place Y	1 400 m	-1 °C	1 °C

2.1.1 In Table 1 the weather responsible for causing the differences in temperature is likely to occur when ...

A anabatic winds are blowing
B the winter is warm
C there is a cloud barrier at 1 300 m
D a cold front is situated over the area
E the nights are clear and cold

2.1.2 In Table 1 the most likely answer for the lower temperatures at X is ...

A Y has a sunny aspect while X has a north facing slope
B X has snow while Y has not
C the air at X is drier than that at Y
D during the night there has been rapid terrestrial radiation and cold air has dropped down the valley sides
E B and D

2.1.3 Which statement is correct about an urban heat island during the day?

A due to general subsidence the horizontal component increases
B due to a decrease in stability and an increase in turbulence the vertical dimension of the heat island decreases
C due to an increase in stability and an decrease in turbulence the vertical dimension of the heat island increases
D due to a decrease in stability and an increase in turbulence the vertical dimension of the heat island increases
E none of these

2.1.4 If all other factors remain constant except the stream becomes ... at some point, the water will speed up.

A shallower
B narrower
C sandier
D B and C
E A and B

2.1.5 Braided streams occur where the channel floor is ...

A very deep
B very narrow
C very wide
D very flat
E very flat and wide

2.1.6 Which of the following features would you NOT find in the lower stage of a river?

A flood plain
B interlocking spurs
C levees
D estuaries
E rapids

2.1.7 A confluence is ...

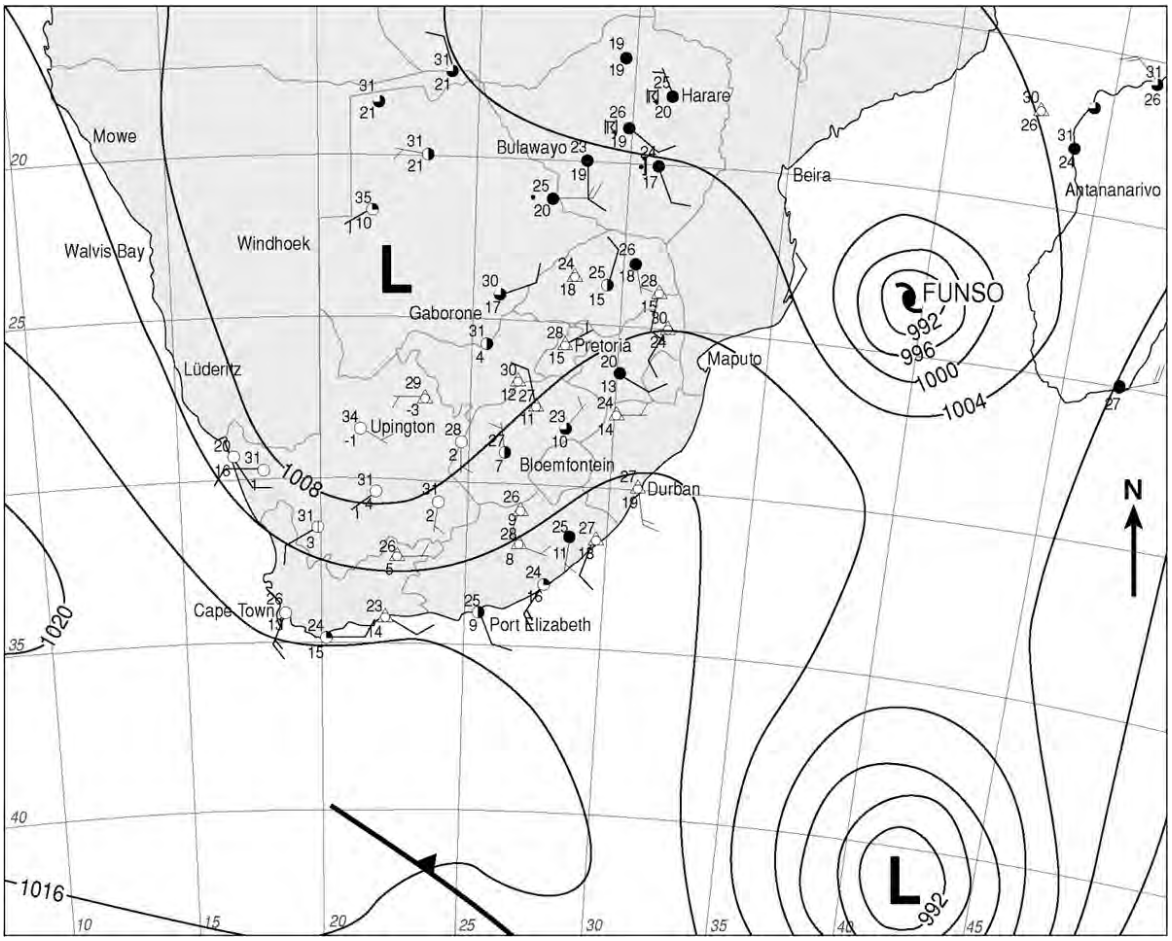
A where a river starts
B a branch of a main river
C where the river flows into the sea
D the point where two rivers join
E the high ground between two rivers

2.1.8 The headwaters of a stream are always located ...

A at the terminus of the stream where it enters another body of water
B at the midpoint of the longitudinal profile of the stream
C at the source of the stream
D at the mouth of the stream
E at the stream's base level

8×2=(16)

2.2 South Africa's weather. Study the synoptic weather map of 25 January 2012 below and answer the questions that follow.



Synoptic weather map of 25 January 2012

2.2.1 What is the name given to the climatic system called Funso? (1)

2.2.2 State four conditions necessary for systems like Funso to form. 4×2=(8)

2.2.3 Draw a fully labelled cross-section through Funso to show clouds and air movements. 4×2=(8)

2.2.4 Including Funso, how many of these climatic systems have there been in this area this season. 1×2=(2)

2.2.5 Systems like Funso are given different names in different parts of the world. State what they called in (a) the USA and (b) Japan. 2×2=(4)

2.2.6 State three reasons why this synoptic map shows a summer condition. 3×2=(6)
(29)

2.3 Geomorphology – Fluvial processes

2.3.1 What is meant by the term graded river? 1×2=(2)

2.3.2 With the aid of well-labelled diagrams describe the difference between a graded river and an ungraded river. 6×2=(12)

2.3.3 What is meant by the term rejuvenation? 1×2=(2)

2.3.4 List four causes of rejuvenation. 4×2=(8)

2.3.5 List three landforms caused by rejuvenation. 3×2=(6)
(30)
[75]

SECTION B: HUMAN GEOGRAPHY

QUESTION 3

3.1 Multiple choice. Mark the best answers to the questions below.

3.1.1 In rural areas the failure of industrialisation and the modernisation of agricultural practices has led to ...

A voluntary resettlement
B rural-urban migration
C basic need philosophy
D formal resettlement
E push-pull factors

3.1.2 What are the advantages of nucleated rural settlement?

A economic
B political
C can make farming easier
D social
E all of these

3.1.3 Which of these statements is true?

A The development of new shopping centres has occurred mainly in the CBD.
B The development of new industry has been in the rural-urban fringe.
C The development of new industry has been in the CBD.
D The development of new industry has been away from major transport links.

3.1.4 Which of the four classifications of industry must be located where the resources are found?

A secondary
B tertiary
C primary
D quaternary

3.1.5 Even if the Gross Domestic Product index is used to measure the well-being of a country, it will fail to show ...

A growth in secondary industries
B variations within countries
C growth within tertiary industries
D growth within primary industries

3.1.6 Arable land is ...

A used for growing crops
B used for raising sheep and/or cattle
C not suitable for farming
D unsuitable for irrigation
E both A and B

3.1.7 South Africa's mineral reserves can be extended by ...

A conserving use of materials
B substituting other materials that accomplish the same thing
C recycling materials
D all of these

3.1.8 A factor limiting the development of industry in the Cape Town area is ...

A the cold Benguela current
B the agricultural raw materials
C the lack of flat ground
D the unskilled labour
E the long distance to the big markets in Gauteng

8×2=(16)

3.2 Settlement. Study the photograph below showing a rural settlement in KwaZulu-Natal and answer the questions that follow.

3.2.1 State why this settlement is classified as a nucleated rural settlement. 2×2=(4)

3.2.2 Many of the young men in this area have moved to the cities of Pietermaritzburg and Durban.

a State the name of this movement. 1×1=(1)

b Describe three push factors that might have caused the young men to move.3×2=(6)

c Describe three barriers the young men might have met in their move to the city.3×2=(6)

3.2.3 There are advantages and disadvantages of living in a nucleated rural settlement.

a Describe three social advantages. 3×2=(6)

b Describe three economic disadvantages of this settlement type. 3×2=(6)

(29)

3.3 Economic geography of South Africa. Study Table 2 below and then answer the questions that follow.

Table 2 The contributions made by some sectors of the economy to the GDP – 2011	
Agriculture, forestry and fishing	3%
Mining and quarrying	7%
Manufacturing	19%
Electricity	2%
Finance, real estate, business services	22%
Construction	3%
Internet	2%
Wholesale and retail trade	13%
Social and personal services	20%
Transport	9%

3.3.1 Which of the four economic sectors contributed most to South Africa's GDP? 1×2=(2)

3.3.2 State the contribution made by the primary sector to the GDP. 1×2=(2)

3.3.3 Classify the following economic sectors from the table as primary, secondary, tertiary or quaternary:

a social and personal services
b manufacturing
c Internet. 3×2=(6)

3.3.4 Manufacturing makes up 19% of South Africa's GDP and nearly half this is in Gauteng. Examine two factors favouring manufacturing in Gauteng. 2×4=(8)

3.3.5 Describe three environmental and social problems resulting from the centralisation of manufacturing in Gauteng. 3×4=(12)

(30)

[75]

QUESTION 4

4.1 Matching columns. Match the concept with the correct description.

4.1.1	**Hierarchy of settlements**	**A**	**The reduction in unit cost resulting from large scale production**
4.1.2	**Ribbon development**	**B**	**Light industries which have few basic requirements**
4.1.3	**Urban decay**	**C**	**The minimum number of people in a region required to support a particular shop or service**
4.1.4	**Threshold population**	**D**	**The area around a shop, settlement or central place which is affected by the goods and services on offer**
4.1.5	**Sphere of influence**	**E**	**Low order**
4.1.6	**Economies of scale**	**F**	**A system of grading the various types of settlement according to size**
4.1.7	**Footloose industries**	**G**	**Deterioration especially of the older parts of the town**
4.1.8	**Convenience goods**	**H**	**Urban expansion along roads**

8×2=(16)

4.2 Settlement geography. State whether the following are TRUE or FALSE. Write only T or F next to the number.

4.2.1 Cities attract mainly old people.

4.2.2 Urban sprawl occurs when there are no laws to control what and where people can build.

4.2.3 Construction of 'park and ride' facilities on the fringe of the CBD can help to combat traffic congestion.

4.2.4 Overcrowding is not a problem for most urban areas.

4.2.5 Urbanisation is the result of population migration from rural areas to urban areas.

2×5=(10)

4.3 Remote rural areas and inner cities. Write an essay of approximately ONE page in which you evaluate the validity of this statement. 'There are distinct similarities between remote rural areas and inner cities.' 10×2=(20)

4.4 The economic geography of South Africa. Refer to the photographs below, which show examples of economic activities linked to the informal sector and answer the questions that follow.

4.4.1 Explain why the activities illustrated are classified as being part of the informal sector. 2×2=(4)

4.4.2 Give four characteristics of labour in the informal sector. 4×2=(8)

4.4.3 Give two problems that informal traders experience. 2×2=(4)

4.4.4 Informal economic activities make no direct contribution to the Gross Domestic Product of a country. What is meant by the term GDP? 1×1=(1)

4.4.5 Explain why the statement in 4.4.4 is true. 2×2=(4)

4.4.6 Give two advantages of the informal sector for a country's economic development.2×2=(4)

4.4.7 Give two disadvantages of the informal sector for a country's economic development.2×2=(4)

(29)

[75]

Answers and mark allocation

QUESTION 1

1.1

1.1.1 H ✓✓
1.1.2 D ✓✓
1.1.3 A ✓✓
1.1.4 B ✓✓
1.1.5 E ✓✓
1.1.6 F ✓✓
1.1.7 C ✓✓
1.1.8 I ✓✓

8×2=(16)

1.2

1.2.1 A South Indian high ✓✓
B South Atlantic high ✓✓ 2×2=(4)

1.2.2 Extra tropical cyclone or frontal depression or mid-latitude cyclone ✓✓ 1×2=(2)

1.2.3 Isobar ✓✓ 1 028 hPa ✓✓ 1×2=(2)

1.2.4 South Indian high ✓ (1)

1.2.5 Winter ✓✓ 1×2=(2)

1.2.6 Three of: cold front passing over the land; high pressure systems in northerly position; temperatures in low 20s and high teens; cloudless conditions; high pressure over the land; no rain ✓✓ ✓✓ ✓✓ 3×2=(6)

1.2.7 Berg wind ✓✓ (2)

1.2.8 Hot 30°C due to adiabatic heating as air descends the escarpment from KH to the coastal LP. ✓✓ Dry (dew point temperature -3°C) as the air has come from the interior Kalahari or Continental high.✓✓ Gentle wind from the interior as the pressure gradient is low. ✓✓ Absence of cloud due to dry conditions.✓✓ 4×2=(8)

(29)

1.3

1.3.1 Abstraction occurs when the stream on one side of the watershed is more energetic than the stream on the other side. ✓✓ Headward erosion is a type of erosion which occurs at the source of a stream. It lowers the land surface, allowing the stream source to rise further back, or up the hill. ✓✓ 2×2=(4)

1.3.2 River capture occurs where a river cuts through a watershed ✓✓ and intercepts a river flowing on a higher level. ✓✓ 2×2=(4)

1.3.3 A Captured stream ✓✓
B Captor or pirate stream ✓✓
C Watershed ✓✓
D Elbow of capture ✓✓
E Windgap ✓✓ 5×2= 10)

1.3.4 Stream B eroding actively through watershed at C – headward erosion ✓✓ through watershed ✓✓ captured headwaters of stream A. ✓✓ 3×2=(6)

1.3.5 River B has been rejuvenated by receiving extra flow as a result of the river capture. ✓✓ 1×2=(2)

1.3.6 Two of: incised meanders, alluvial terraces, knickpoint waterfalls/rapids. ✓✓ ✓✓ 2×2=(4)

(30)

[75]

QUESTION 2

2.1

2.1.1 E ✓✓

2.1.2 D ✓✓

2.1.3 D ✓✓

2.1.4 B ✓✓

2.1.5 E ✓✓

2.1.6 E ✓✓

2.1.7 D ✓✓

2.1.8 C ✓✓

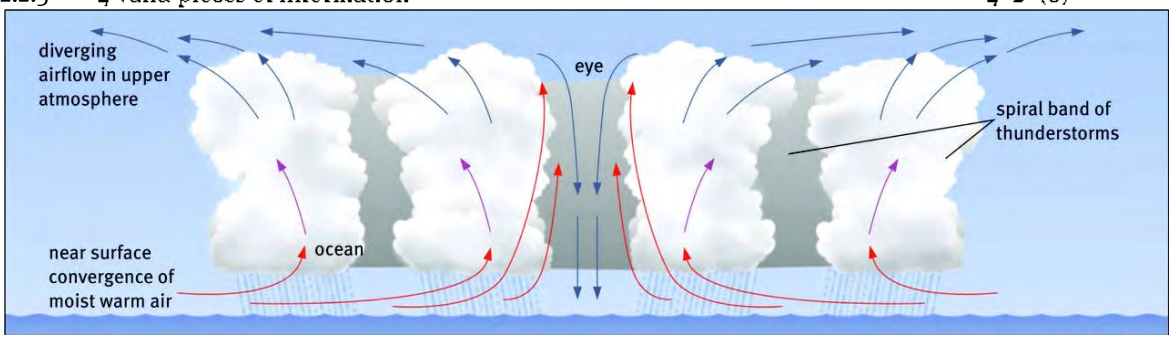
8×2=(16)

2.2

2.2.1 Tropical cyclone ✓ 1×1=(1)

2.2.2 Four of: sea temperature of at least 26 °C; high humidity; unstable air; little surface friction; light variable winds; air pressure must be low with closed isobars; divergence of air at upper levels. ✓✓ ✓✓ ✓✓ ✓✓ 4×2=(8)

2.2.3 4 valid pieces of information ✓✓ ✓✓ ✓✓ ✓✓ 4×2=(8)



2.2.4 Six ✓✓ 1×2=(2)

2.2.5 a hurricane ✓✓

b tornado ✓✓ 2×2=(4)

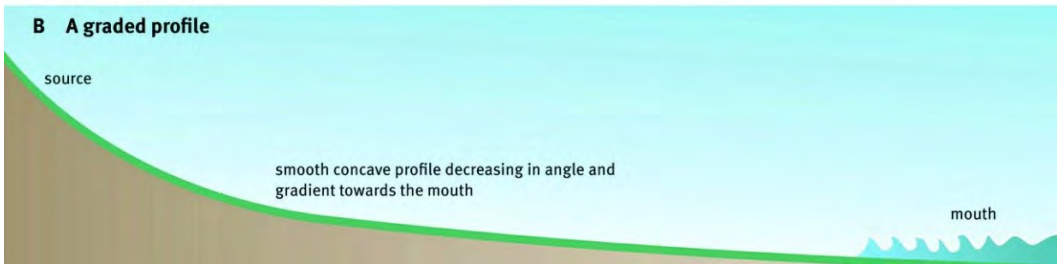
2.2.6 Three of: temperatures in high 20s and low 30s; presence of a tropical cyclone; cold front well to the south of the country; low pressure trough over the land; east of the country is cloudy; low depression to the dew point over the land. ✓✓ ✓✓ ✓✓ 3×2=(6)

(29)

2.3

2.3.1 A graded river is in a state of equilibrium and neither erodes nor deposits. ✓✓ 1×2=(2)

2.3.2



Three valid points for each diagram. 3×2×2=(12)

2.3.3 River rejuvenation takes place when there is an increase of a river's speed and erosive power. ✓✓ 1×2=(2)

2.3.4 Four of: a worldwide lowering of sea level; raising of the land through forces in the Earth's crust; a significant increase in rainfall; a rapidly fl owing tributary that joins the main stream; river capture (stream piracy) where the increased volume of water enlarges the erosion capacity of the stream. 4×2=(8)

2.3.5 Knickpoints, ✓✓ terraces, ✓✓ incised meanders. ✓✓ 3×2=(6)

(30)

(75)

QUESTION 3

3.1

3.1.1 B ✓✓

3.1.2 E ✓✓

3.1.3 B ✓✓

3.1.4 C ✓✓

3.1.5 B ✓✓

3.1.6 A ✓✓

3.1.7 D ✓✓

3.1.8 E ✓✓

8×2=(16)

3.2

3.2.1 It is rural because the majority of the people are engaged in agriculture. ✓✓ It is nucleated because the houses are all close together. ✓✓ 2×2=(4)

3.2.2 a Rural-urban migration ✓✓ 1×1=(1)

b Push factors. Three of: mechanisation on farms; poor medical and family planning services; few primary and secondary schools; poor housing; limited socialising opportunities; poor services; poverty; natural hazards; insufficient land. ✓✓ ✓✓ ✓✓ 3×2=(6)

c Three of: costs; dangers; distance; transport; leaving family ✓✓ ✓✓ ✓✓ 3×2=(6)

3.2.3 a Three of: daily social contact; community involvement; people do not live in isolation from one another in time of need; protection is easier when people are together; there are enough people to share the workload; there is a possibility of a co-operative farming system; farmers can agree each to plant a different crop and share the cost of ploughing and fertilising land. ✓✓ ✓✓ ✓✓ 3×2=(6)

b Three of: no independent decision making; individuals cannot show initiative; fields are scattered; which wastes time; machinery is shared; it is difficult to be economically successful; plots may be too small to be economically viable; modern farming methods cannot be applied effectively. ✓✓ ✓✓ ✓✓ 3×2=(6)

(29)

3.3

3.3.1 Tertiary ✓✓ (2)

3.3.2 10% ✓✓ (2)

3.3.3

a Tertiary ✓✓

b Secondary ✓✓

c Quaternary ✓✓ 3×2=(6)

3.3.4 Two of, with discussion: labour, markets, electricity, transport, infrastructure, raw materials, water, capital. ✓✓ ✓✓ 2×4=(8)

3.4.5 Two of, with discussion: air pollution, water pollution, congestion, overcrowding, time delays, traffic jams, land shortage, high cost of living, crime, stress, ill-health. ✓✓ ✓✓ 4×3=(12)

(30)

[75]

QUESTION 4

4.1

4.1.1 F ✓✓
4.1.2 H ✓✓
4.1.3 G ✓✓
4.1.4 C ✓✓
4.1.5 D ✓✓
4.1.6 A ✓✓
4.1.7 B ✓✓
4.1.8 E ✓✓

4×3=(12)

4.2

F ✓✓
T ✓✓
T ✓✓
F ✓✓
T ✓✓

2×5=(10)

4.3 Remote rural areas and inner cities. There are many possible answers but you need to show that you have picked up on the similarities between the two areas. Some answers could be:

- Both areas are characterised by low income residents.
- Residents have a limited education.
- They usually have high birth rates.
- A high dependency ratio.
- Little government investment in these areas.
- Services are expensive and sometimes lacking.
- Decreased demand for labour and unemployment: due to mechanisation and minimum wages (especially in rural areas).
- Low wages: due to lack of skills and education due to old apartheid policies.
- Lack of skills due to lack of education and access to facilities.
- Decline in services: inaccessibility, high costs.
- Limited new investment: often investment is focused on urban areas, many rural areas are still lacking investment.
- Dereliction and blight due to large numbers of people per house (especially in the inner cities).

Ten valid points will give full marks. 10×2=(20)

(30)

4.4

4.4.1 Two of: they don't have formal premises; they are trying to survive in a poor situation; they don't have to pay taxes; they are on the pavement/side of the road. ✓✓ ✓✓ 2×2=(4)

4.4.2 Four of: low level of skills; low level of education; low level of productivity; small scale operations; variable and irregular income; individually owned; little time or incentive to improve their education or training; many have HIV/Aids and as the illness gets worse

work become increasingly difficult; unsafe and unhealthy working conditions; not a member of a trade union. ✓✓ ✓✓ ✓✓ ✓✓ 4×2=(8)

4.4.3 Two of: exposed to the weather; subject to xenophobia; goods confiscated by authorities; theft; against the law; unprotected. ✓✓ ✓✓ 2×2=(4)

4.4.4 The total value of a country's output in a year ✓ (1)

4.4.5 Informal traders are in the formal sector, no records of their sales are kept and so they pay no tax ✓✓, and are not incorporated into the GDP. ✓✓ (4)

4.4.6 Two of: provides a living for many people; even though they pay no tax they money they earn circulated through the economy; the money they earn is spent on goods and services. ✓✓ ✓✓ 2×2=(4)

4.4.7 Two of: do not contribute to the tax base; take business away from formal traders who do pay tax; do not buy property. ✓✓ ✓✓ 2×2=(4)

(29)

[75]

Final Exam Paper 2

TIME 1½ HOURS

ANSWER ALL THE QUESTIONS

Study the topographic map and orthophoto of 2528DA Cullinan on pages 316 and 317 in the Learner's Book and answer the questions that follow.

1 Multiple choice questions. Mark the best answer to the questions below.

1.1 The latitude of spot height 1432 (A4) is ...
- A 28° 33' 15" E
- B 25° 37' 25" E
- C 25° 37' 25" S
- D 28° 33' 15" S
- E 25° 38' 35" E

1.2 The longitude of spot height 1408 (B2) is ...
- A 28° 31' 28" S
- B 25° 38' 55" E
- C 25° 39' 05" E
- D 28° 33' 15" S
- E None of these

1.3 The land use south-west of the large dam (C1) is ...
- A agricultural
- B residential
- C recreational
- D mining
- E A and D

1.4 The land use at the point marked 1 on the orthophoto is ...
- A mining
- B farming
- C industry
- D recreation
- E none of these

1.5 The contour interval represents the...
- A accuracy of the surveying work
- B horizontal spacing between the contour lines
- C number of contour lines on a map
- D vertical spacing between contour lines

E none of these

1.6 The natural resources in the area covered by the topographic map include ...
A minerals
B agricultural products
C surface water
D A and B
E A, B and C

1.7 The town of Cullinan is in ...
A Limpopo
B KwaZulu-Natal
C Free State
D Eastern Cape
E none of these

7×2=(14)

1.8 The cultivation of fruit is an important activity at the farm called Tweefontein (A1).
A true
B false (1)

(15)

2 Calculations

2.1 A hiker walks in a straight line from the trigonometrical station numbered 53(C2) to spot height 1459 in C3 to.
2.1.1 Calculate the length of the walk. 1×2=(2)
2.1.2 What is the true bearing of the walk? 1×2=(2)
2.1.3 Calculate the gradient of the walk. Show all your working. 3×2=(6)
2.1.4 This gradient is classified as:
A gentle
B moderate
C steep
D very steep (2)

2.2 A motorist drives from Pretoria along the road numbered 513 to the police station in D2 . Calculate the length of the drive. 1×2=(2)

2.3 Calculate the approximate area, in hectares, of the excavation labelled Premier Diamond Mine in D1 And D2. 1 hectare = 10 000 m². 3×2=(6)

(20)

3 Analysis and interpretation

3.1 Agriculture. Study the farm named Doornkraal (A3) and answer the questions that follow.
3.1.1 State, with two reasons, whether you think this farm is a subsistence or a commercial farm. 3×2=(6)
3.1.2 List one likely crop that is grown on this farm. 1×2=(2)

3.1.3 Explain the use of the lines of trees on this farm. 1×2=(2)

3.2 Settlement. A developer wishes to build a housing complex in the area for wealthy retired people. The developer is offered three sites: Site 1 is at Louwsbaken between the road and the dam (C3). Site 2 is around spot height 1446 (D1). Site 3 is around spot height 1382 (A1).

3.2.1 Select the site you think is the best and give two reasons why you have chosen this site. 2×2=(4)

3.2.2 Give one disadvantage for each of the other two sites. 2×2=(4)

3.3 List three advantages of the area covered by the topographical map to an industrialist wishing to start a factory manufacturing food products. 3×2=(6)

3.4 State the name of the street pattern in the area called Refilwe (B2). (1)

(25)

4 Geographic information systems

4.1 Matching columns. Match the descriptions with the concepts.

4.1.1	**Preparing data according to specific GIS norms and standards as to make it available to a variety of users**	**A**	**Data integration**
4.1.2	**Protection of data in a GIS for commercial, personal or national security reasons**	**B**	**Data security**
4.1.3	**Integration and exchange of data between various organisations in order to make better decisions**	**C**	**Data sharing**
4.1.4	**Combining data from different maps into one map which summarises the overlaying process**	**D**	**Data standardisation**
		E	**Data representation**

4×2=(8)

4.2 Classify the topographic map either as a raster or vector data structure (1)

4.3 From block C2 identify ONE example of a line, point and area geographical feature. 3×1=(3)

4.4 Classify each of your examples in question 4.3 as a node, arc or polygon feature. 3×1=(3)

(15)

[75]

Answers and mark allocation

1

1.1 C ✓✓
1.2 E ✓✓
1.3 D ✓✓
1.4 D ✓✓
1.5 B ✓✓
1.6 E ✓✓
1.7 E ✓✓
1.8 B ✓

7×2+1=(15)

2

2.1.1 1 650–1 750 m ✓✓ 1×2=(2)
2.1.2 91–93° ✓✓ 1×2=(2)
2.1.3 G = V/H ✓✓ 1×2=(2)
V = 1 481– 1 459 m = 22 m ✓✓ 1×2=(2)
H = 1 700 m
G = $\frac{22}{1\,700}$ = 1:77 ✓✓ 1×2=(2)
2.1.4 A ✓ (1)
2.2 34–35 km ✓✓ 1×2=(2)
2.3 Breadth=400–500 m ✓✓
Length=800–900 m ✓✓ Area – l × b=450 m × 850 m =± 38 ha
Accept 32–44 ha ✓✓ 3×2=(6)
(20)

3

3.1.1 Commercial ✓✓ – Two of: farm has a name, has infrastructure, large scale, served by roads, has reservoirs. Any other acceptable answer. ✓✓ ✓✓ 3×2=(6)
3.1.2 Maize is the most likely. ✓✓ Other possibilities are wheat, soya beans, sunflowers 1×2=(2)
3.1.3 The trees are wind breaks which are used to shelter plants from destructive winds. ✓✓ 1×2=(2)
3.2 The most likely place is site 1 – Possible reasons two of: close to the town; close to a main road; trees nearby; close to a dam; level ground; good views; plus any acceptable answer. ✓✓ ✓✓ 2×2=(4)
3.2.2 Site 2 is unacceptable as it is close to the mine, close to machinery, not attractive, plus any acceptable answer. ✓✓
Site 3 is unacceptable as it is too remote, no access roads, plus any acceptable answer. ✓✓ 2×2=(4)
3.3 Three of: existing rail network; existing road network; availability of water; nearby markets in Cullinan; close to the Pretoria and Gauteng markets; availability of labour from Cullinan and Refilwe; flat land; plus any acceptable answer. ✓✓ ✓✓ ✓✓ 3×2=(6)

4

4.1.1 C ✓✓
4.1.2 B ✓✓
4.1.3 A ✓✓
4.1.4 D ✓✓

4×2=(8)

4.2 Vector (1)

4.3 Point: trigonometrical beacon, houses, single trees (any one) ✓ (1)
Line: other roads, contours (any one) ✓ (1)
Area: dam, residential area, golf course (any one) ✓ (1)

4.4 Any point feature – node ✓ (1)
Any line feature – arc ✓ (1)
Any area feature – polygon ✓ (1)

(15)
[75]