Download more resources like this on ECOLEBOOKS.COM

GRADE 12

SECONDARY SCHOOL IMPROVEMENT PROGRAMME (SSIP) 2019 GEOGRAPHY

REVISED

LEARNER NOTES

SESSIONS 6 –9

GEOMORPHOLOGY

TABLE OF CONTENTS

ACTION VERBS IN ASSESSMENTS

VERB	MEANING	SUGGESTED RESPONSE
Account	to answer for - explain the cause of - so as to explain why	Full sentences
Analyse	to separate, examine and interpret critically Full sentences	Full sentences
Annotate	to add explanatory notes to a sketch, map or drawing	Add labels to drawings
Appraise	to form an opinion how successful/effective something is	Full sentences
Argue	to put forward reasons in support of or against a proposition	Full sentences
Assess	to carefully consider before making a judgment	Full sentences
Categorise	to place things into groups based on their characteristics	One-word answers/phrases
Classify	to divide into groups or types so that things with similar characteristics are in the same group - to arrange according to type or sort	One-word answers /phrases
Comment	to write generally about	Full sentences
Compare	to point out or show both similarities and differences	Full sentences
Construct	to draw a shape	A diagram is required
Contrast	to stress the differences, dissimilarities, or unlikeness of things, qualities, events or problems	Full sentences
Create	to develop a new or original idea	Full sentences
Criticise	to make comments showing that something is bad or wrong	Full sentences
Decide	to consider something carefully and decide what should be done	Full sentences
Defend	to say things to protect something	Full sentences
Define	to give the concise and clear meaning	Full sentences
Devise	to invent a method to do something	Full sentences

© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

VERB	MEANING	SUGGESTED RESPONSE
Demonstrate	to show or make clear - to illustrate and explain - to prove by reasoning and evidence - examples can be given	Full sentences
Describe	to list the main characteristics of something - give an account of	Full sentences
Develop	to successfully develop and create a new method/idea	Full sentences
Differentiate	to show the difference between things	Full sentences
Discriminate	to recognise the difference between things	Full sentences
Discuss	to examine by means of argument, presenting both sides and reaching a conclusion	Full sentences
Distinguish	to recognise the difference between things	Full sentences
Draw	to show by means of a sketch	A diagram is required
Evaluate	to make an appraisal or express an opinion concerning the value - to define, analyse and discuss	Full sentences
Examine	to look at something carefully - to analyse and discuss	Full sentences
Explain	to make clear, interpret and spell out the material you present	Full sentences
Find	to make a formal decision about something	Full sentences
Formulate	to express an idea/opinion in a carefully organised way	Full sentences
Give	to state facts without discussions	One-word answers
Identify	to give the essential characteristics of - to name	One-word answers
Illustrate	to show what something is like - to show that something is true	Full sentences
Interpret	to give an explanation of - to give the meaning of	Full sentences
Investigate	To try to find the facts about something	Full sentences
Justify	List to write an itemised series of concise statements to prove or give reasons for decisions or conclusions, using logical argument	Full sentences One-word answers
Locate	to find the exact place where something is	One-word answers
Mention	providing relevant facts	Full sentences
Name	to state something - give, identify or mention	One-word answers
Outline	give a summary, using main points and leaving out minor details	Full sentences
Plan	to think carefully about a series of actions that you need to take in order to achieve something	Full sentences
Predict	to say what you think will happen - to foretell - to say in advance	Full sentences
Prioritise	to place in order of importance	One-word answers

© Gauteng Department of Education

VERB	MEANING	SUGGESTED RESPONSE
Propose	to suggest a plan - to make a formal suggestion	Full sentences
Provide	to state facts without discussions	Full sentences/ one-word answers
Question	to have or express doubts about something	Full sentences
Rate	to consider that something has a particular quality or achieved a particular quality/level	Full sentences/ one-word answers
Recall	to remember something	Full sentences/ one-word answers
Recognise	to accept that something is true or important - to give approval to something	Full sentences/ one-word answers
Recommend	to advise that something should be done	Full sentences
Report	to produce an official statement or written document	Full sentences
Select	to choose something from a greater whole	One-word answers
Sketch	to illustrate with a simple drawing	A diagram is required
Solve	to find a solution to something that is causing difficulties	Full sentences
State	to present information plainly without discussion	One-word answers
Suggest	to propose an explanation or solution	Full sentences
Show	to make clear - to point out - to explain	Full sentences
Support	to show that an idea/statement is true	Full sentences
Tabulate	to group like terms or activities under specific headings	One-word answers/phrases
Tell	to recognise something as a result of knowledge	One-word answers
Test	To examine something to find out if it is satisfactory or has a specific quality	Full sentences
Use	To do something using a specific skill or method	Full sentences
Value	to consider the importance/worth of something	Full sentences
Verify	to check/prove that something is correct	Full sentences
Write	to create a formal document	Full sentences

© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

SESSION NR: GEOMORPHOLOGY
TOPIC: DRAINAGE BASINS IN SOUTH AFRICA

SECTION B: CONTENT NOTES ON DRAINAGE BASINS

TERMINOLOGY / DEFINITIONS

Permeable:	Rock or soil that allow water to move through it quickly e.g. sand
Porosity	Rock or soil with pores where water can be stored
Catchment area	The area from which any rainfall will drain into the river system through surface flow
Drainage Basin	The entire area drained by a river system including the main stream and its tributaries. One drainage basin is separated from another by a major watershed.
River system	A mainstream and all its tributaries
Tributary	Smaller streams that flow to the main stream of a river
Confluence	The place in the river where two tributaries meet
Watershed	High lying areas separating different drainage basins.
Interfluve	The higher (dry) areas between different tributaries
Source	The beginning of all streams (in the higher lying areas – 1 river has many sources)
River mouth	where the river ends in the Sea. The river mouths out in the ocean and deposits all its water in the ocean
Surface run-off	water that runs over the surface of the Earth during and after precipitation and lands up in rivers. Run-off can be divided in direct run-off and indirect run-off.
Direct run-off	Is the water that runs over the surface of the Earth during and directly after precipitation and lands up in rivers

© Gauteng Department of Education

Indirect run-off	Is the water that first infiltrates into the soil and is later released into to streams through base flow.
Base flow	Refers to the groundwater that seeps into streams
Groundwater	Water stored in porous soil and rock masses
Water Table	the top level of groundwater; beneath the water table the soil is saturated with water.

STUDY TIPS:
Geomorphology is a very visual part of Geography. Every feature can be displayed by a picture. There are many new terms and definitions that you need to know off by heart and be able to identify on a sketch. There are also processes explaining hoe river work, landscapes develop and how human and landscapes influence each other. If you know this section well you can obtain good marks, but it involves a lot of studying. You must know the terms to understand the work.

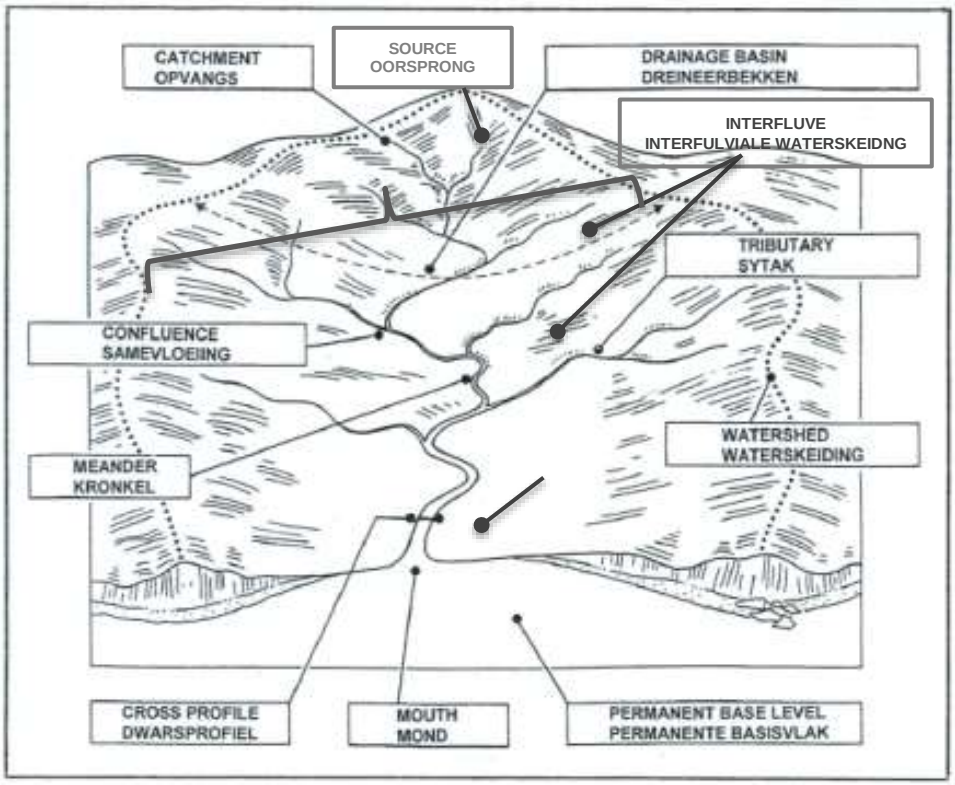
© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

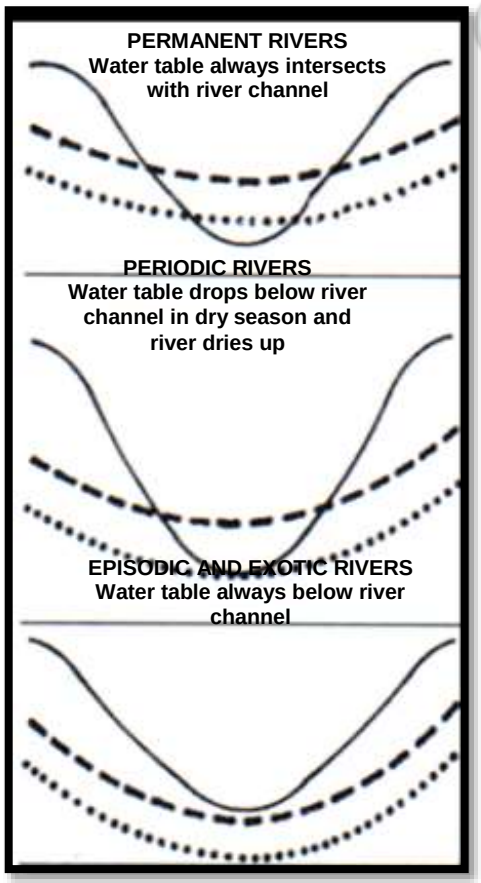
Download more resources like this on ECOLEBOOKS.COM

1. DRAINAGE BASINS IN SOUTH AFRICA

1.1. Concepts of a Drainage basin illustrated - explained in the definitions



1.2 Types of rivers – these sketches illustrate cross sections through the valleys of different types of rivers.



- Permanent rivers flow throughout the year due to continuous base flow even though the direct run-off may vary. They occur in high rainfall areas, e.g. Tugela River in KZN.
- Periodic rivers flow every year during the rainy season when they receive direct and indirect run-off, but dry up when the water table drops during the dry season. They occur in semi-arid areas, e.g. most rivers in the central part of South Africa.
- Episodic rivers flow occasionally when it rains in a dry area. In many cases the river does not even reach the sea as infiltration takes place fast, because the water table is always far below the valley floor - Aub and Nossob rivers
- Exotic rivers flow continuously through dry areas, because they receive water from more humid areas upstream, e.g. Nile and lower part of the Orange River.

- - - - - Water table in rainy season
..... Water table in dry season

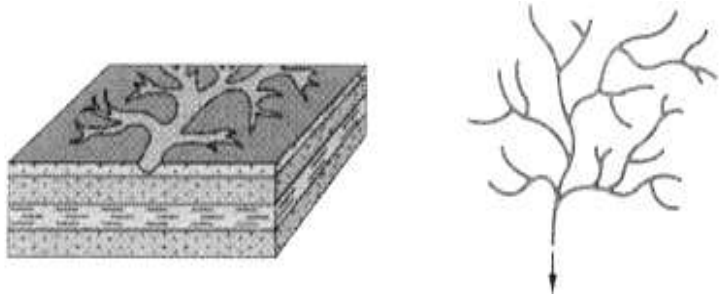
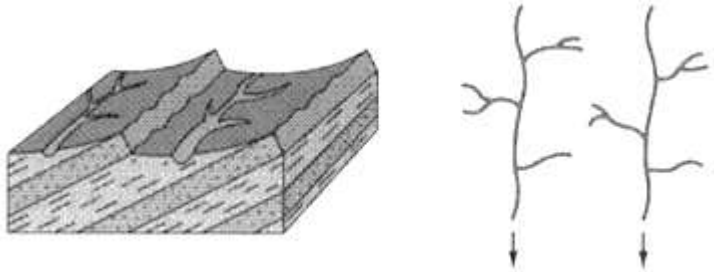
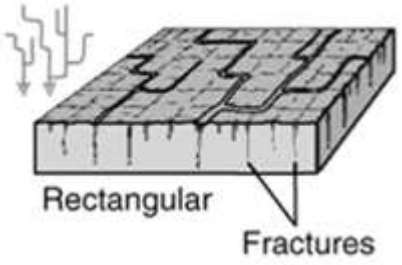
© Gauteng Department of Education

© Gauteng Department of Education

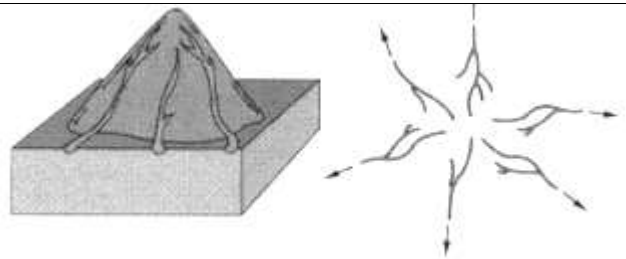
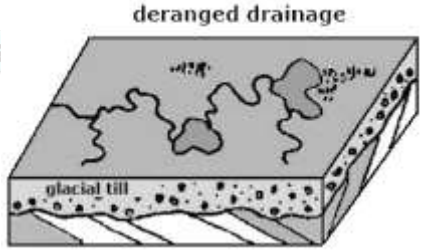
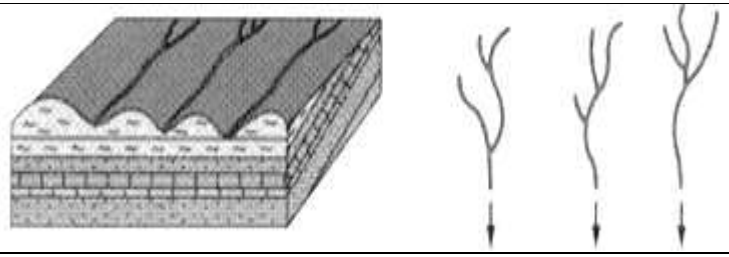
DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

1.3. Underlying rock structure, development and characteristics of the following drainage patterns:

Drainage pattern	Characteristics	Underlying rock structure	Sketch
Dendritic	Tree shaped drainage pattern Tributaries join at acute angles from upstream	Homogenous / Uniform rock with a moderate slope. Rock resists erosion equally e.g. horizontal sedimentary, igneous or metamorphic rock strata	
Trellis	Parallel main stream with tributaries joining the main streams at right angles. The main streams run along parallel valleys and the tributaries drain the slopes	Alternative hard and soft rock on the surface. Fold mountains with parallel ridges and valleys.	
Rectangular	Tributaries and main streams have right angles in the streams	Jointed / fractured rock River flow along the fracture as it erodes the weakest areas first,	

© Gauteng Department of Education

Drainage pattern	Characteristics	Underlying rock structure	Sketch
Radial	Rivers flow in different directions form a central point	Hills, islands and volcanic cones cause river to flow from the high central point outwards	
Centripetal	Streams flow to a central point	Drainage in a volcanic crater or circular inland drainage basin. Streams end in a lake or inland sea.	
Deranged	No apparent pattern visible. May lakes and marches and river seams to stop and start randomly	Glaciated till and newly glaciated plains	
Parallel	Tributaries run nearly parallel to each other and join the main stream at very acute angles.	Develops on steep slopes where streams take the shortest route downhill.	

© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

1.4 FACTORS INFLUENCING DRAINAGE DENSITY

Drainage density is the total length of all streams in a drainage basin divided by the total area of the drainage basin.

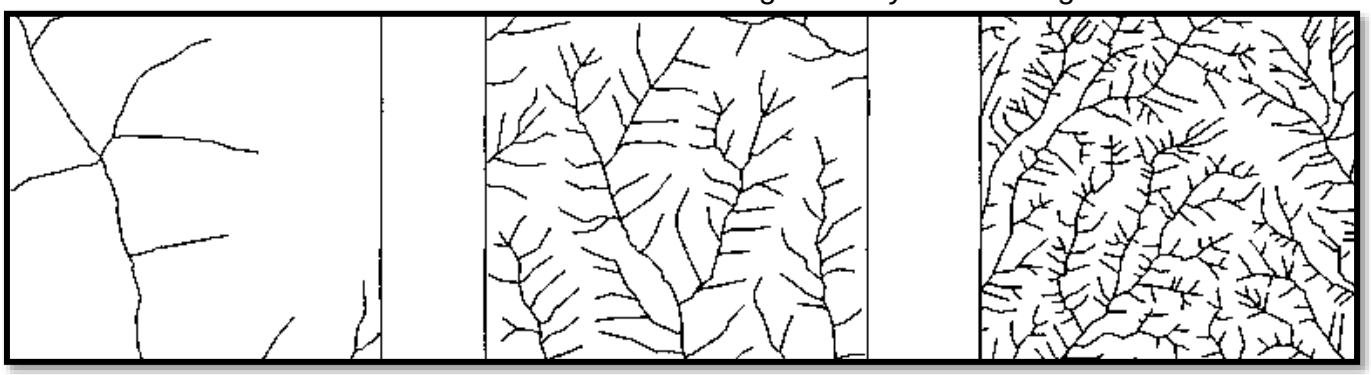
Fine / high drainage density – many streams / area (drainage basin)

Medium drainage density – average amount of streams / area of drainage basin

Low / Course drainage density – few streams / area

The factors influencing drainage density also influence runoff and infiltration. If the runoff is more the drainage density will be finer and if the infiltration is more the density will be courser.

Low / course Medium drainage density High / Fine



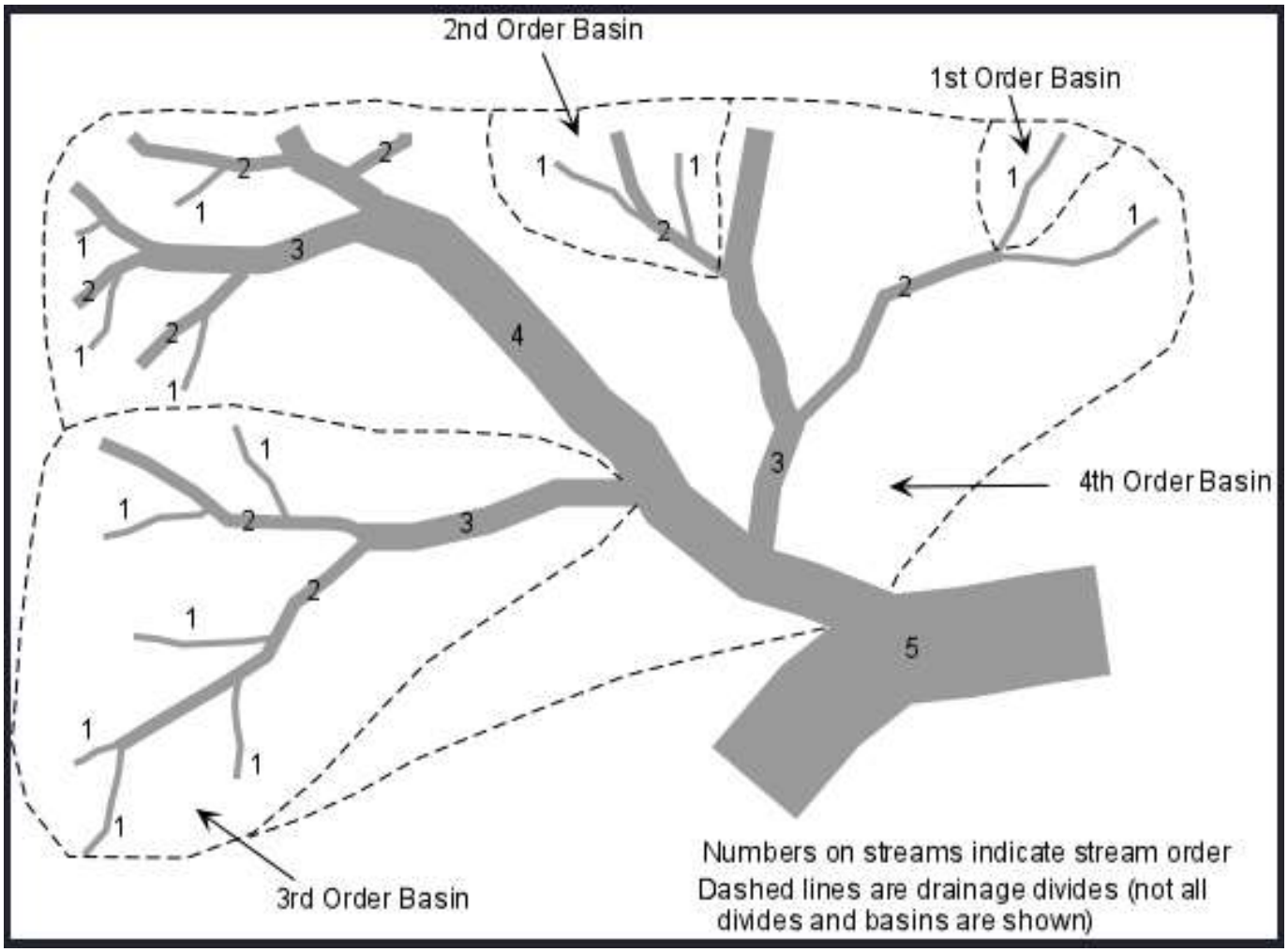
http://sageography.myschoolstuff.co.za/wp-content/uploads/sites/2/2013/07/DDensity.gif

Factors influencing drainage density	Runoff / infiltration	Drainage density
Precipitation	Heavy rain / high rainfall regions – less infiltration and more runoff Soft rain / prolonged rain – more infiltration and less runoff Summer convection rain – more evaporation, fast runoff, less infiltration Winter frontal rainfall – less evaporation more infiltration, less runoff	High / Fine Low / course High / Fine Low / course
Soil moisture	Saturated soil – more runoff – less infiltration Dry soil – low water content – high infiltration - less runoff	High / Fine Low / course
Vegetation	Sparse vegetation – more runoff and less infiltration Dense vegetation – more infiltration and less runoff	High / Fine Low / course
Slope/Gradient	Steep slopes – fast runoff – little infiltration Gradual slopes – slow runoff – more infiltration	High / Fine Low / course
Porosity	Porous rock / soil – more infiltration – less runoff Non-porous rock / soil – less infiltration – more runoff	Low / Course High / Fine
Permeability	Permeable rock / soil – more infiltration – less runoff Impermeable rock / soil – less infiltration – more runoff	Low / Course High / Fine

© Gauteng Department of Education

1.5 DETERMINING STREAM ORDER

Ordering of stream make it possible to classify streams according to the number of tributaries they have. All origin streams are order 1 streams.The order of the stream increases when 2 same order streams meet. A second order stream occurs where 2 first order streams join. It remains a second order stream when another first order stream joins. It only becomes a third order stream when 2 second order streams join. Thus where 2 similar order streams meet it goes to the next order, e.g. 3 meets

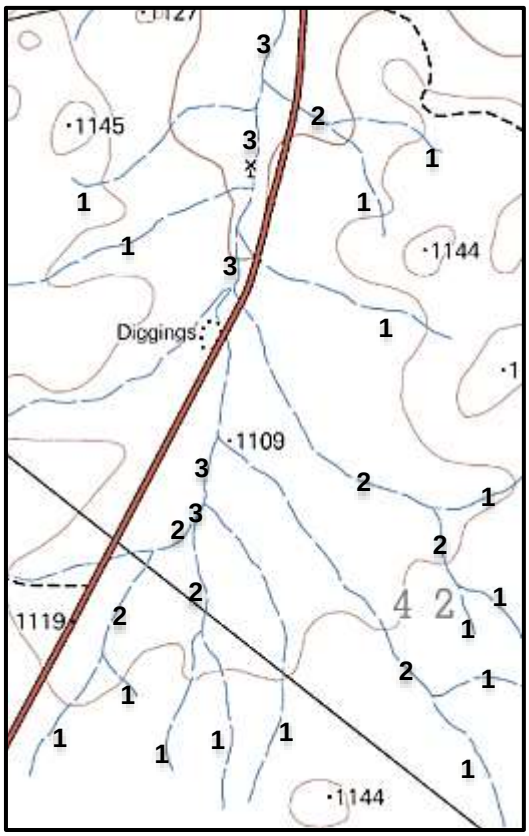


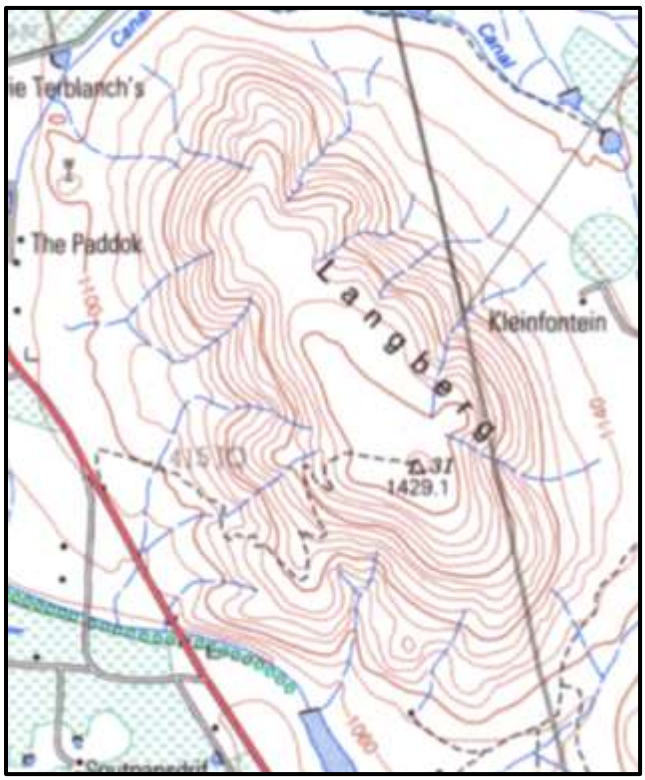
© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

1.6USE OF TOPOGRAPHIC MAPS TO DETERMINE DRAINAGE PATTERNS, DRAINAGE DENSITY AND STREAM ORDER



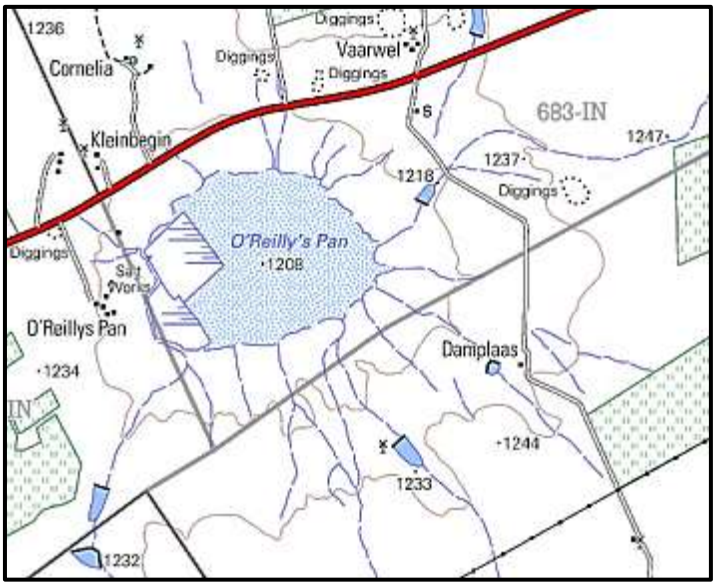


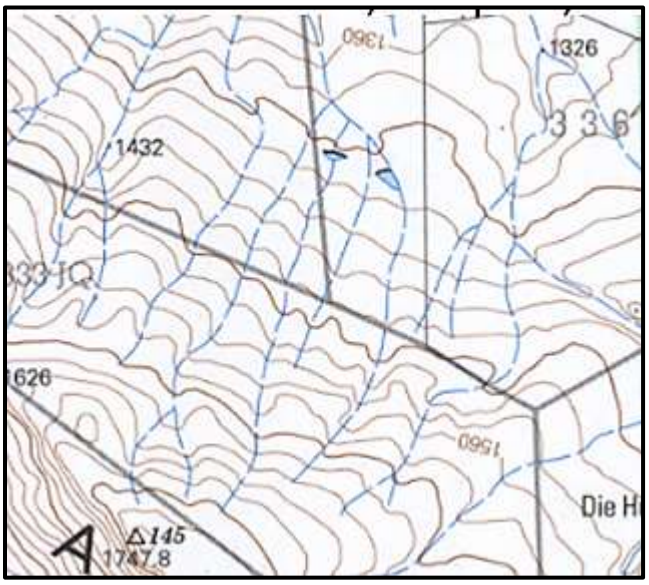
Radial stream pattern around a Mesa

The stream flow form Langberg down all different directions. The map clip above show a dendritic stream pattern. The stream flow Northwards and the stream order is 3 where the map clip ends Notice that the tributaries join the main stream at an oblique angle form the upstream side. The stream pattern looks like a tree – in this case it is upside down. This area consist of uniform igneous or sedimentary rock.

The map clip on the right illustrates a trellis drainage pattern. The main streams are parallel and the tributaries join the main stream at right angles. This occur in parallel valleys and ridges like fold mountain ridges.

© Gauteng Department of Education



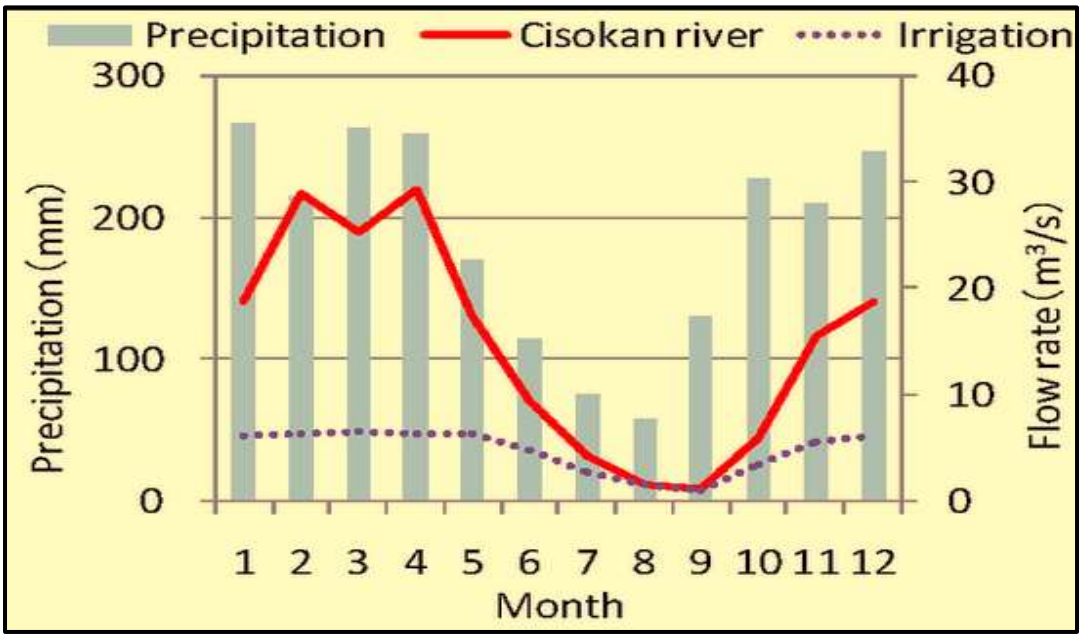


The map clip above shows a centrifugal drainage pattern where all the streams drain to one central low lying point like a lake or an inland sea. In this case O'Reilly's pan.	Parallel stream patters develop on steep slopes where streams take the shortest course downslope. The steeper the slope the smaller the angle at which the tributaries join.

1.7 DISCHARGE OF A RIVER

River discharge refers to the amount of flow in a river passing a specific point at a specific time. This amount is measured in cumec (cubic meters / second). The discharge of a river is illustrated on a flood regime for a year and on a flow hydrograph for shorter periods of time.

The flood regime below illustrates the rainfall per month as well as the discharge of the river. Notice that there is a close relationship between the amount of rainfall and the discharge in the river. .

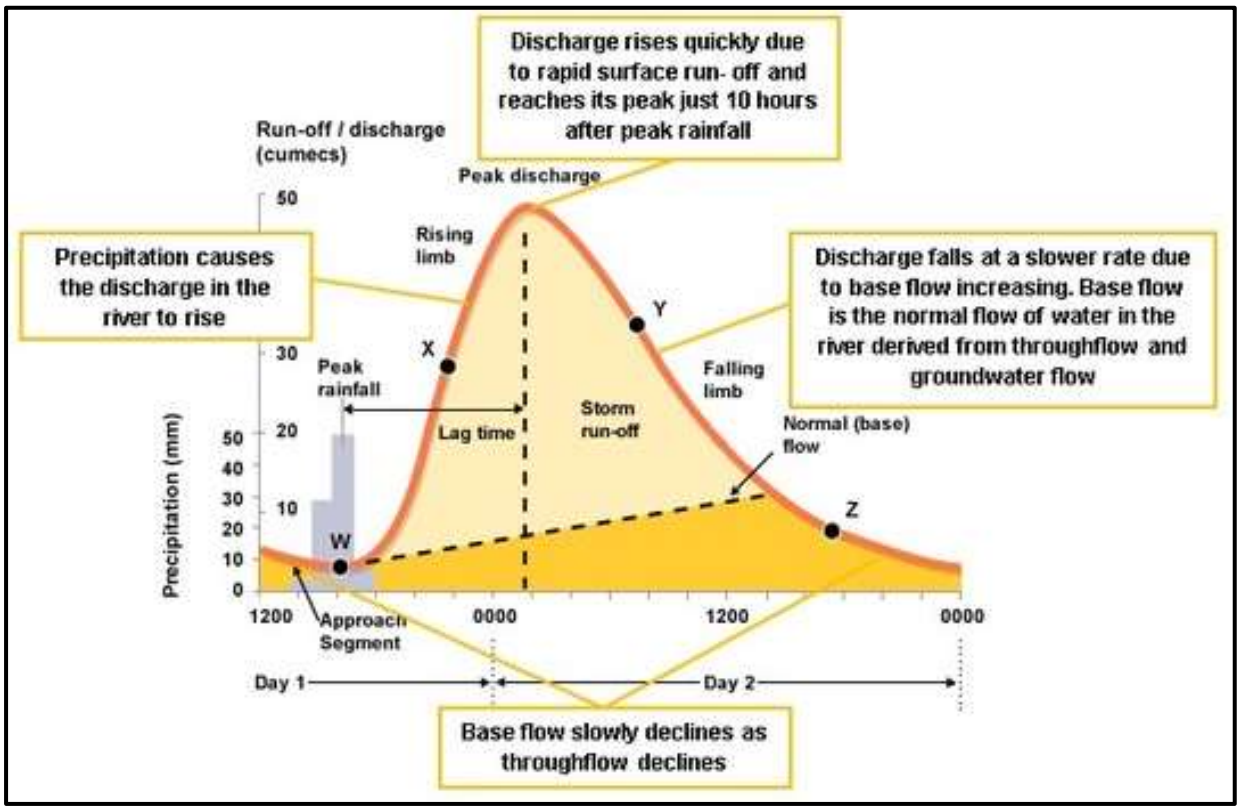


© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

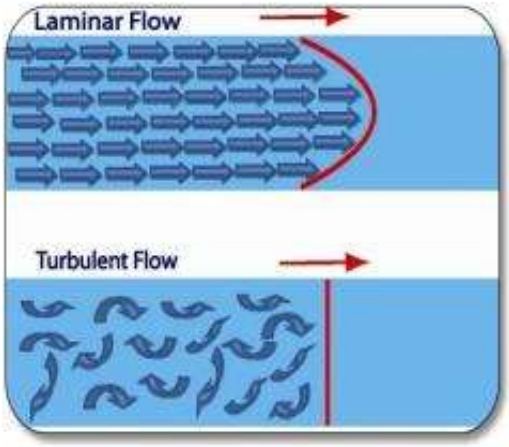
The flow hydrograph below illustrates the amount of rainfall and the discharge in a river over a period of two days. There is a period called lag time after the peak rainfall and before the peak discharge as it take time for rainwater to run over the surface and collect in streams. Base flow is only released after a longer period as infiltrated water is released slowly into the streams. A river is in flood as soon as it pushes over its banks and water cover areas that are normally dry. The flood peak will change when the runoff change e.g. more runoff in a shorter period will lead to a higher flood peak or faster runoff due to deteriorated vegetation will lead to a shorter lag time and higher flood peak.



http://thebritishgeographer.weebly.com/hydrographs-recurrence-intervals-and-drainage-basin-responses.html

- **Laminar flow:** Water flow in layers over each other and the surface of the river looks smooth. This occurs in wider smooth channels with a gradual gradient.
- **Turbulent flow:** water flow in circular patterns and surface looks white and bubbly. This occurs on narrow rough channels with a steep gradient.

© Gauteng Department of Education



http://me312.byu.edu/sites/me312.byu.edu/files/news/Flow_0.JPG

http://www.dwaf.gov.za/Groundwater/Groundwater_Dictionary/index.html?laminar_flow.htm

ÉcoleBooks

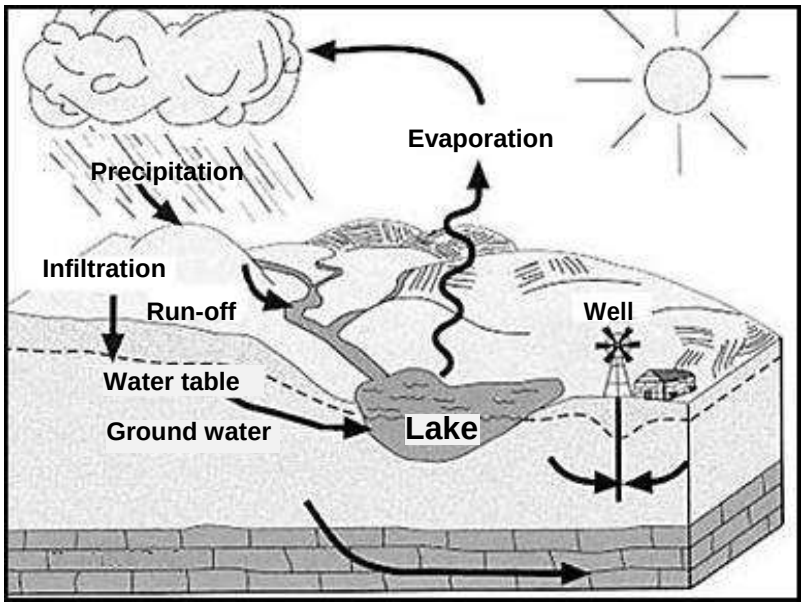
© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

SECTION B: TYPICAL EXAM QUESTIONS ON DRAINAGE BASINS

FIGURE 1.1: GROUND WATER (NOVEMBER 2015)



[Adapted from www.pcastate.mn]

1.1 Refer to FIGURE 1.1, which illustrates factors that could influence the amount of ground water in the soil, and answer the questions that follow.

1.1.1 Define the term *ground water.* (1 x 1) (1)

1.1.2 Differentiate between the terms *infiltration* and *run-off*. (2 x 1) (2)

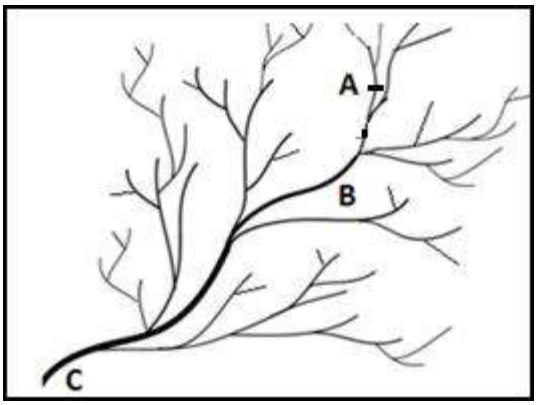
1.1.3 What role does ground water play in the discharge (stream flow) of a permanent river during the dry season? (1 x 2) (2)

1.1.4 What effect would the construction of the well have on the water table? (1 x 2) (2)

1.1.5 Explain, in a paragraph of approximately EIGHT lines, FOUR natural factors that can cause the water-table level to rise. (4 x 2) (8)

© Gauteng Department of Education

FIGURE 1.2 DRAINAGE BASIN (NOVEMBER 2014)



1.2 Refer to the drainage basin in FIGURE 1.2 and answer the questions that follow.

1.2.1 Name the drainage pattern shown in the diagram.

1.2.2 At which angle do the tributaries join the main stream?

1.2.3 State whether this drainage pattern is associated with a surface that has a uniform or varied resistance to erosion.

1.2.4 Is the dominant process at **A** on the sketch erosion or deposition?

1.2.5 State the stream order at point **A**.

1.2.6 Is area **B** an interfluve or a watershed?

1.2.7 Is the discharge of the river greater at **A** or at **C**? (7 x 1) (7)

© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

FIGURE 1.3 DRAINAGE BASIN (FEB/ MARCH 2015)

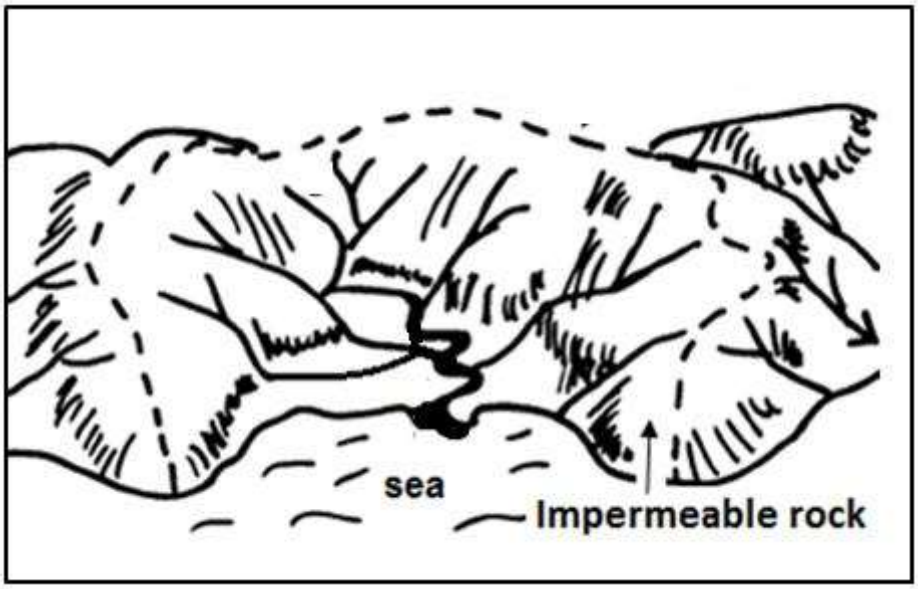


FIGURE 1.3 is based on a drainage basin with a high surface run-off.

1.3.1 Define the term *drainage basin*. (1 x 1) (1)

1.3.2 What is the meaning of the term *surface run-off*? (1 x 1) (1)

1.3.3 Give TWO possible reasons for the high surface run-off that is experienced in a drainage basin. (2 x 2) (4)

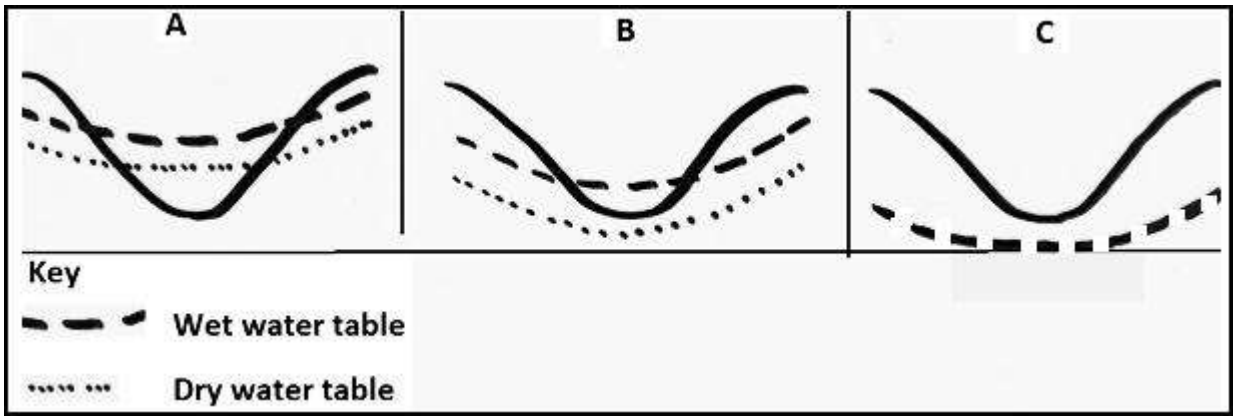
1.3.4 There is a third-order river where the river flows into the sea.

(a) Will the stream order increase or decrease during periods of high rainfall? (1 x 2) (2)

(b) Explain your answer to QUESTION 1.3.4(a). (2 x 2) (4)

© Gauteng Department of Education

FIGURE 1.4 TYPES OF RIVERS (FEB/MARCH 2015)



1.4 Refer to FIGURE 1.4 showing three different types of rivers and answer the following questions.

1.4.1 Which river (**A**, **B** or **C**) is an episodic river?

1.4.2 Which river (**A**, **B** or **C**) is periodic?

1.4.3 Which river (**A**, **B** or **C**) is exotic in its lower course?

1.4.4 In which picture (**A**, **B** or **C**) is the river bed always below the water table?

1.4.5 In which picture (**A**, **B** or **C**) does the groundwater never contribute to stream flow?

1.4.6 In which picture (**A**, **B** or **C**) does the river flow only during the rainy season?

1.4.7 In which picture (**A**, **B** or **C**) does the river flow only after heavy showers?

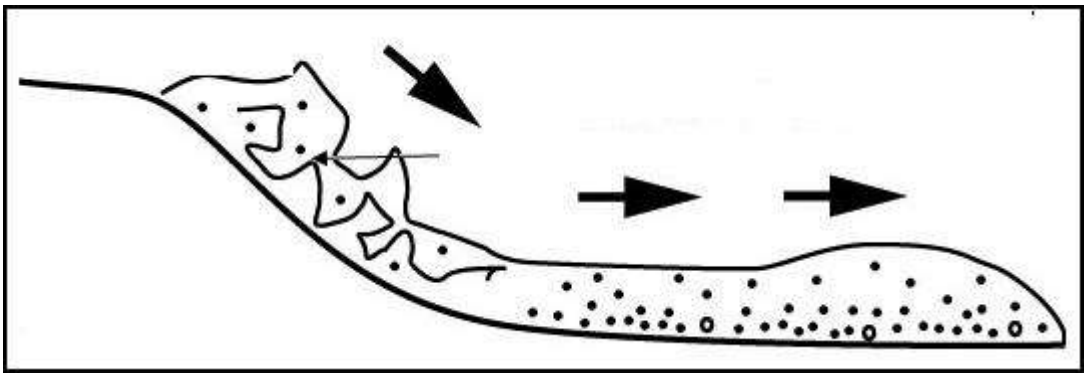
1.4.8 In which picture (**A**, **B** or **C**) does the river always intersect the water table? (8 x 1) (8)

© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

FIGURE 1.5: RIVER FLOW PATTERNS (NOVEMBER 2014)



1.5 Refer to FIGURE 1.5 showing river flow patterns. Indicate whether each of the following statements refer to turbulent or laminar flow in a river. You may use the same answer for more than one question.

1.5.1 Associated with a river bed that is level and even

1.5.2 Associated with an irregular and swirling flow

1.5.3 Effective in eroding and transporting sediment

1.5.4 Commonly occurs in the upper course of a river

1.5.5 Water flows in thin layers

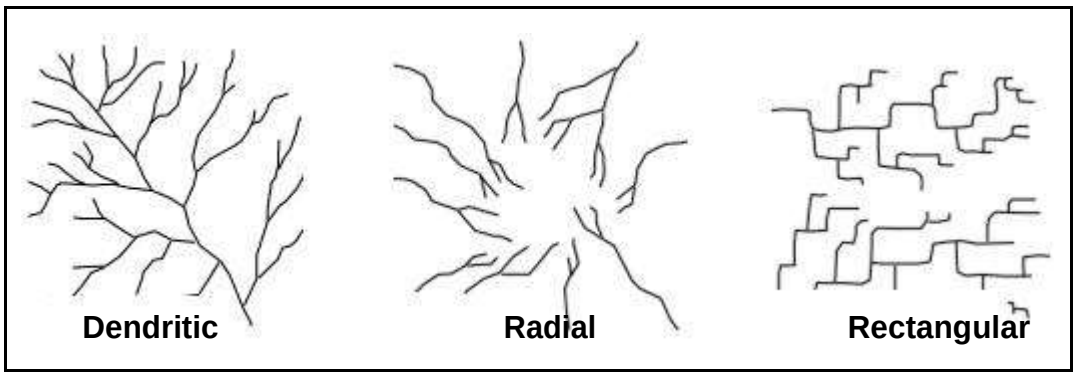
1.5.6 Associated with a higher river velocity

1.5.7 Occurs where rapids are visible in the river's course

1.5.8 Has a larger stream load-carrying capacity (8 x 1) (8)

© Gauteng Department of Education

FIGURE 1.6: DRAINAGE PATTERNS (EXAMPLAR 2014)



[Source: www.tulane.edu]

1.6 Study the drainage patterns in FIGURE 1.6. Indicate to which drainage pattern each of the following descriptions refers. Write only the answer next to the question number (1.6.1–1.6.8) in the ANSWER BOOK. You may use the same answer more than once.

1.6.1 Resembles the branches of a tree

1.6.2 Forms on rocks that have many joints and faults

1.6.3 The main stream has many 90º angles along its course

1.6.4 This pattern forms on rocks that have a uniform resistance to erosion

1.6.5 Streams flow away from a central point

1.6.6 The tributaries join the main stream at acute (small) angles

1.6.7 Only forms on massive igneous rocks

1.6.8 The tributaries join the main stream at a 90º angle

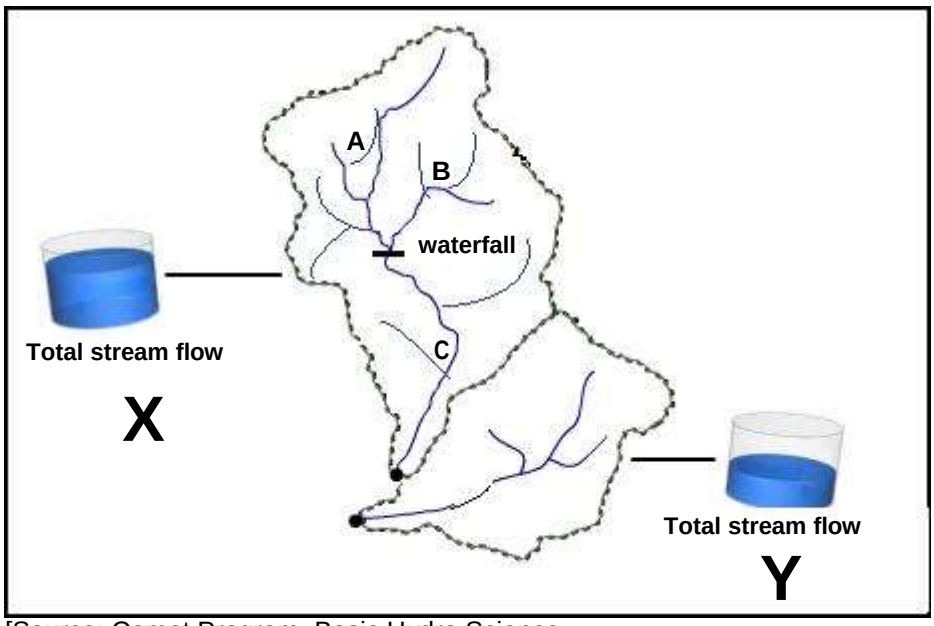
(8 x 1) (8)

© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

FIGURE 1.7: DRAINAGE BASINS (EXAMPLAR 2014)



[Source: Comet Program, Basic Hydro Science

1.7 FIGURE 1.7 illustrates two drainage basins.

1.7.1 Define the term *drainage basin.* (1 x 1) (1)

1.7.2 Define the term *drainage density.* (1 x 1) (1)

1.7.3 Which drainage basin, **X** or **Y**, has a greater drainage density? (1 x 2) (2)

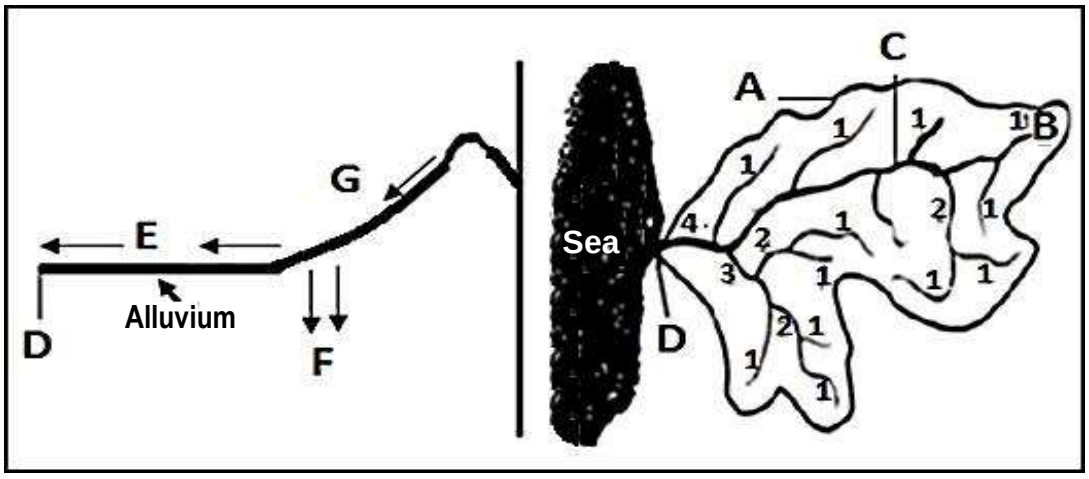
1.7.4 Give ONE reason for your answer to QUESTION 1.7.3. (1 x 2) (2)

1.7.5 Discuss TWO factors that could result in a drainage basin having a high drainage density. (2 x 2) (4)

1.7.6 Explain the impact of urban development at points **A**, **B** and **C** on the drainage density of drainage basin **X**. (2 x 2) (4)

© Gauteng Department of Education

FIGURE 1.8: DRAINAGE BASIN AND ITS PROFILE (NOVEMBER 2015)



[Adapted from *Ohio Stream Management Guide 3*]

1.8 Refer to the drainage basin and its profile in FIGURE 1.8 and answer the questions that follow.

1.8.1 Name ONE source of water for drainage basin **A**.

1.8.2 Give a term that best describes **B**.

1.8.3 Name the stream order at point **C**.

1.8.4 Name a fluvial feature that is likely to form at point **D** in the river.

1.8.5 Name the process that gave rise to alluvium being found at point **E**.

1.8.6 Give a term that describes the movement of water at **F**.

1.8.7 Give the term that describes the high-lying area surrounding drainage basin **A**.

1.8.8 Give the term that describes the lowest point to which a river erodes.

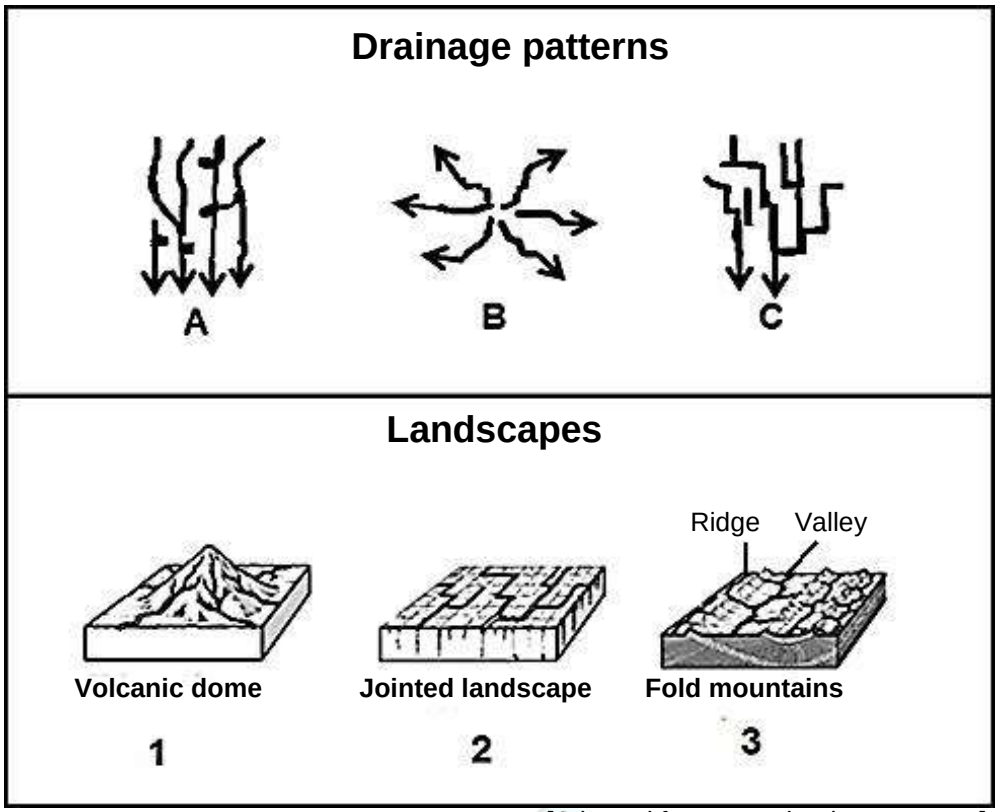
(8 x 1) (8)

© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

FIGURE 1.9 : DRAINAGE PATTERNS AND LANDSCAPES (NOVEMBER 2015)



[Adapted from www.landscapes.com]

1.9 Study FIGURE 1.9 , illustrating drainage patterns and landscapes, and answer the questions that follow.

1.9.1 Indicate whether each drainage pattern, **A**, **B** and **C**, refers to landscape **1**, **2** or **3**, on which it is likely to develop. (3 x 1) (3)

1.9.2 Name ONE factor that results in different drainage patterns forming. (1 x 2) (2)

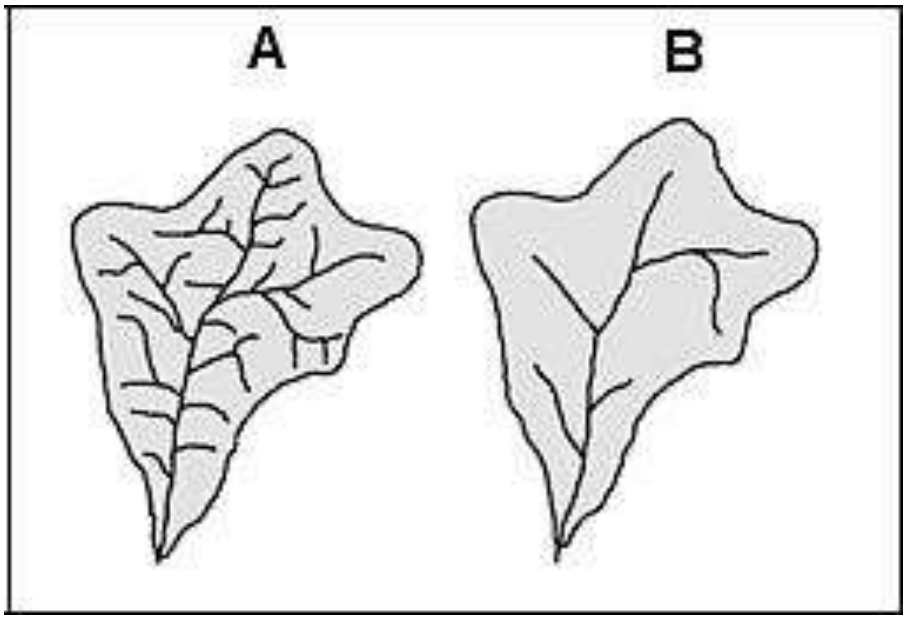
1.9.3 State ONE characteristic of drainage pattern **B**. (1 x 2) (2)

1.9.4 Describe the rock type and underlying structure associated with drainage pattern **C**. (2 x 2) (4)

1.9.5 Why do the tributaries in landscape **3** join the main stream at a 90° angle? (2 x 2) (4)

© Gauteng Department of Education

FIGURE 1.10 : DRAINAGE DENSITY (NOVEMBER 2015)



1.10 Refer to FIGURE 1.10, showing the drainage density of two drainage basins of the same size. Indicate whether each of the descriptions below refers to drainage basin **A** or drainage basin **B**. Write only the letter (**A** or **B**) next to the question number (1.10.1–1.10.7) in the ANSWER BOOK.

1.10.1 Dense vegetation cover that prevents surface run-off

1.10.2 A drainage basin that experiences high rainfall

1.10.3 A drainage basin that has mainly clay soils

1.10.4 A drainage basin that has mainly permeable rock

1.10.5 A river that flows through hilly areas

1.10.6 A drainage basin that has porous rock with sandy soils

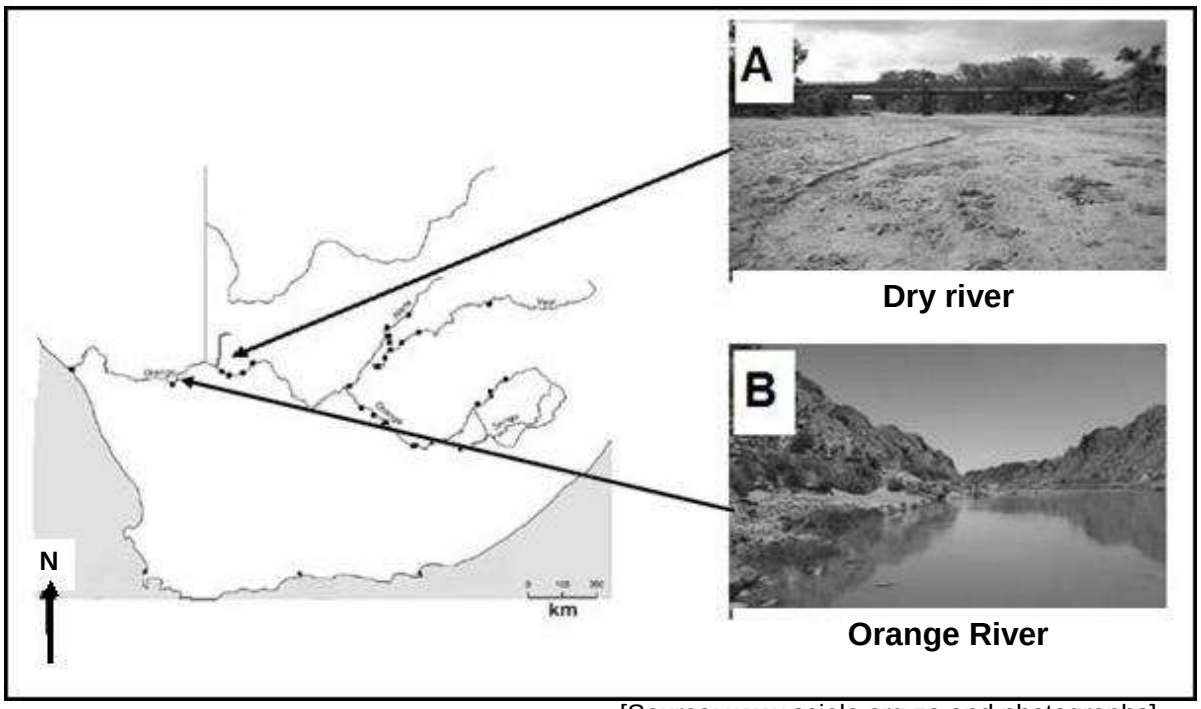
1.10.7 A river that flows through gently sloping land (7 x 1)(7)

© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

FIGURE 1.11: RIVER TYPES (NOVEMBER 2015)



[Source: www.scielo.org.za and photographs]

1.11 Refer to FIGURE 1.11 and answer the questions that follow. Photograph **A** shows an episodic river in the north-western part of South Africa. Photograph **B** shows a permanent river in the same area.

1.11.1 (a) What is an *episodic river*? (1 x 1) (1)

(b) Give evidence from the photograph to support your answer to QUESTION 1.5.1(a). (1 x 1) (1)

(c) State TWO physical factors that will influence the discharge (stream flow) of this river. (2 x 2) (4)

1.11.2 (a) What do you call a permanent river that flows through dry areas? (1 x 2) (2)

(b) Explain why the river in QUESTION 1.5.2(a) flows throughout the year. (2 x 2) (4)

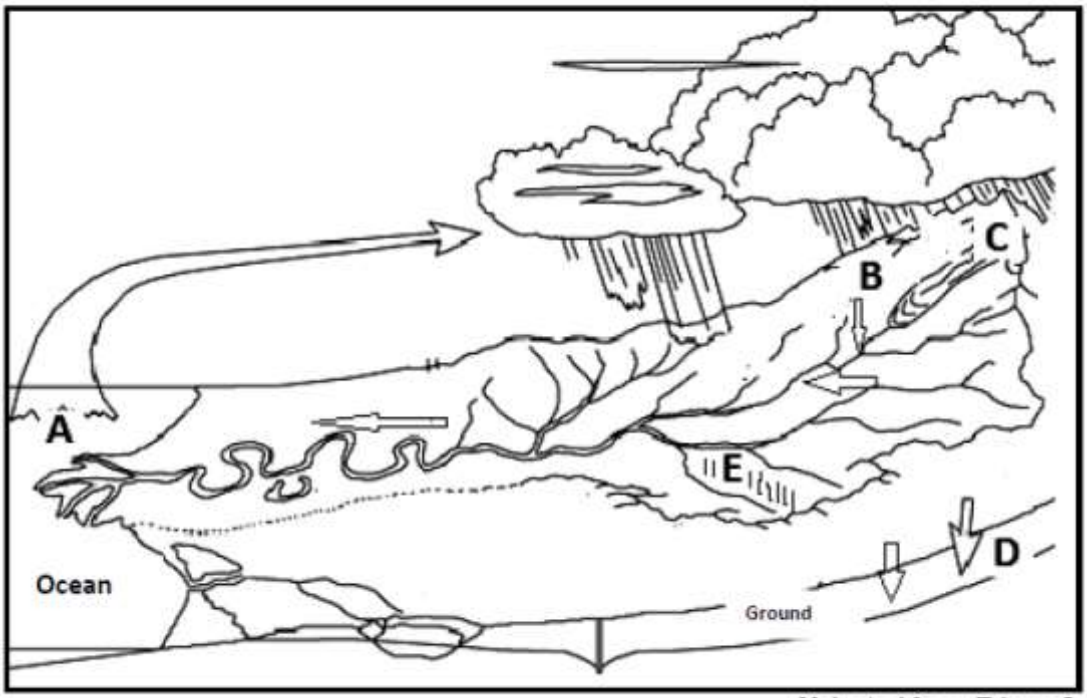
(c) State ONE advantage of this river for farmers in the north-western part of South Africa. (1 x 2) (2)

© Gauteng Department of Education

SECTION C: HOMEWORK QUESTIONS ON DRAINAGE BASINS

QUESTION 1: 8 minutes [10] ***(Adapted from NSC March 2013 Paper 1)***

FIGURE RIVER BASIN



[Adapted from *Edexcel*]

(HINT: Definitions counts up to 20% of the exam – make sure you get these marks)

1. Refer to the figure above which shows a drainage basin run-off system and complete the statements below.

1.1 The process where water changes into water vapour (A) is known as …

1.2 The place where two or more streams meet (B) in a drainage basin is called a/an …

1.3 The area where a river originates (C) is called it's …

1.4 The process where water seeps into the ground (D) is called …

1.5 A high-lying area (E) that separates two streams in the same drainage basin is called a/an …

1.6. The area drained by a river and all its tributaries is called a …..

1.7. The main stream and all the tributaries are called a ….

1.8. The water that enters the stream from groundwater is called …..

1.9. The water that enters streams after rainfall is called ….

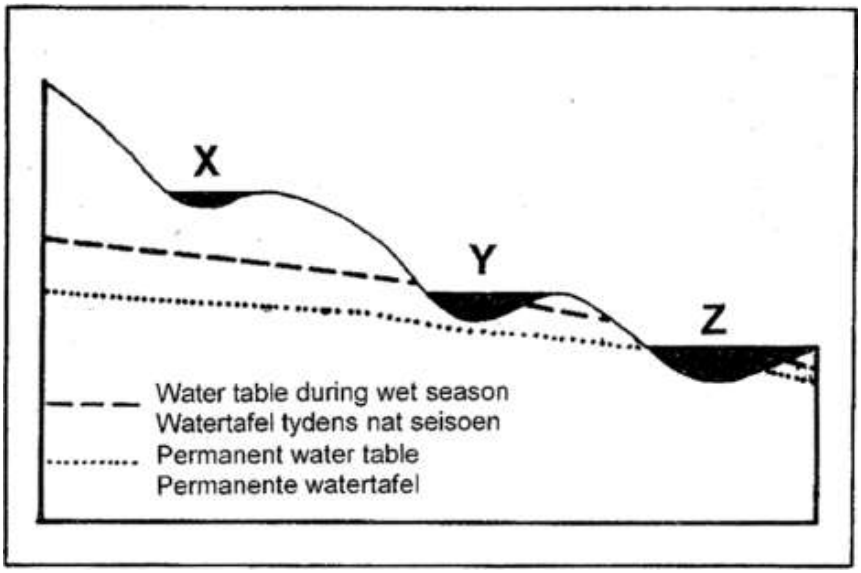
1.10. The upper course of this stream has a …. drainage pattern. (10 x 1 = 10)

© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

QUESTION 2: 16 minutes [20] ***(Sketch form NSC Paper – new questions)***



HINT: You must be able to interpret sketches – try to give a heading and label.

2. Study the figure above illustrating different types of rivers and answer the questions below.

2.1. Identify the types of river illustrated by X, Y and Z respectively. (3 x 1 = 3)

2.2. In what type of rainfall regions would rivers X, Y and Z occur respectively? (3 x 1 = 3)

2.3. Define the term water table. (1 x 2 = 2)

2.4. Explain why the water table is not at the same level all the time. (2 x 1 = 2)

2.5. Which river will have the largest discharge? (1 x 1 = 1)

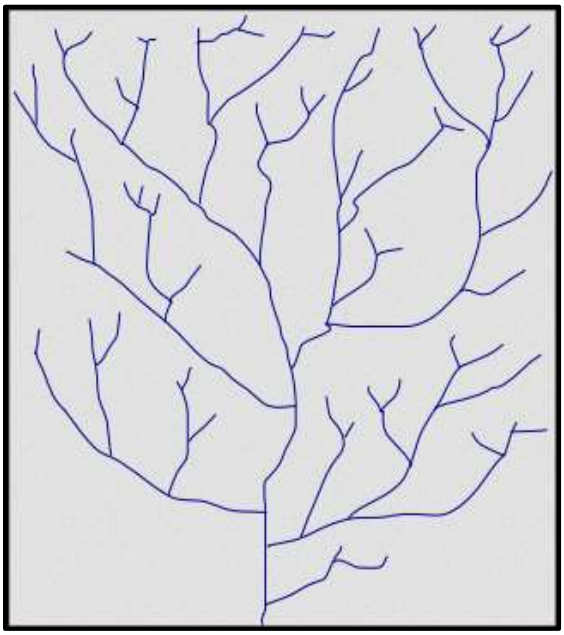
2.5. a) Which of these rivers will be most useful for humans? (1 x 1 = 1)

b) Motivate your answer in 2.4.a. (2 x 2 = 4)

2.6. Explain where river Z gets its water from. (2 x 2 = 4)

QUESTION 3: 13 minutes [16] ***(Sketch form NSC Paper – new questions)***

3. Use the sketch here to answer the questions:



3.1. Identify the stream pattern. (1 x 1 = 1)

3.2. Describe the underlying rock structure. (2 x 1 = 2)

3.3. What is the final order of the stream? (1 x 2 = 2)

3.4. Which order streams are the shortest? (1 x 1 = 1)

3.5. Which order stream will have the steepest gradient? Motivate your answer. (2 x 1 = 2)

3.6. Which order streams occurs the most? (1 x 1 = 1)

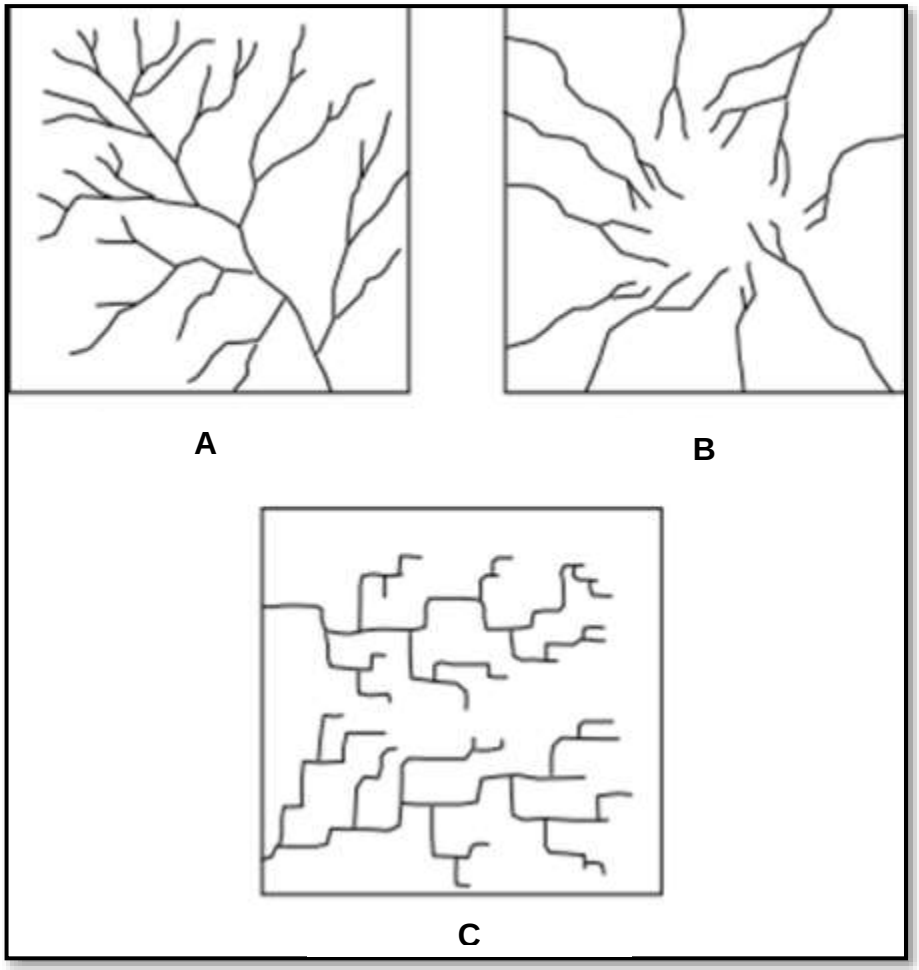
3.7. Would you say that this river has a fine or course drainage density? (1 x 1 = 1)

3.8. List and describe three factors that can have an influence on the drainage density of the

© Gauteng Department of Education

river. (3 x 2 = 6)

QUESTION 4: 12 minutes [15] ***(Sketch form NSC Paper – new questions)***



HINT: drainage basins are also asked with underlying rock structure – know it well This is often asked in paper two where real map examples must be identified.

© Gauteng Department of Education

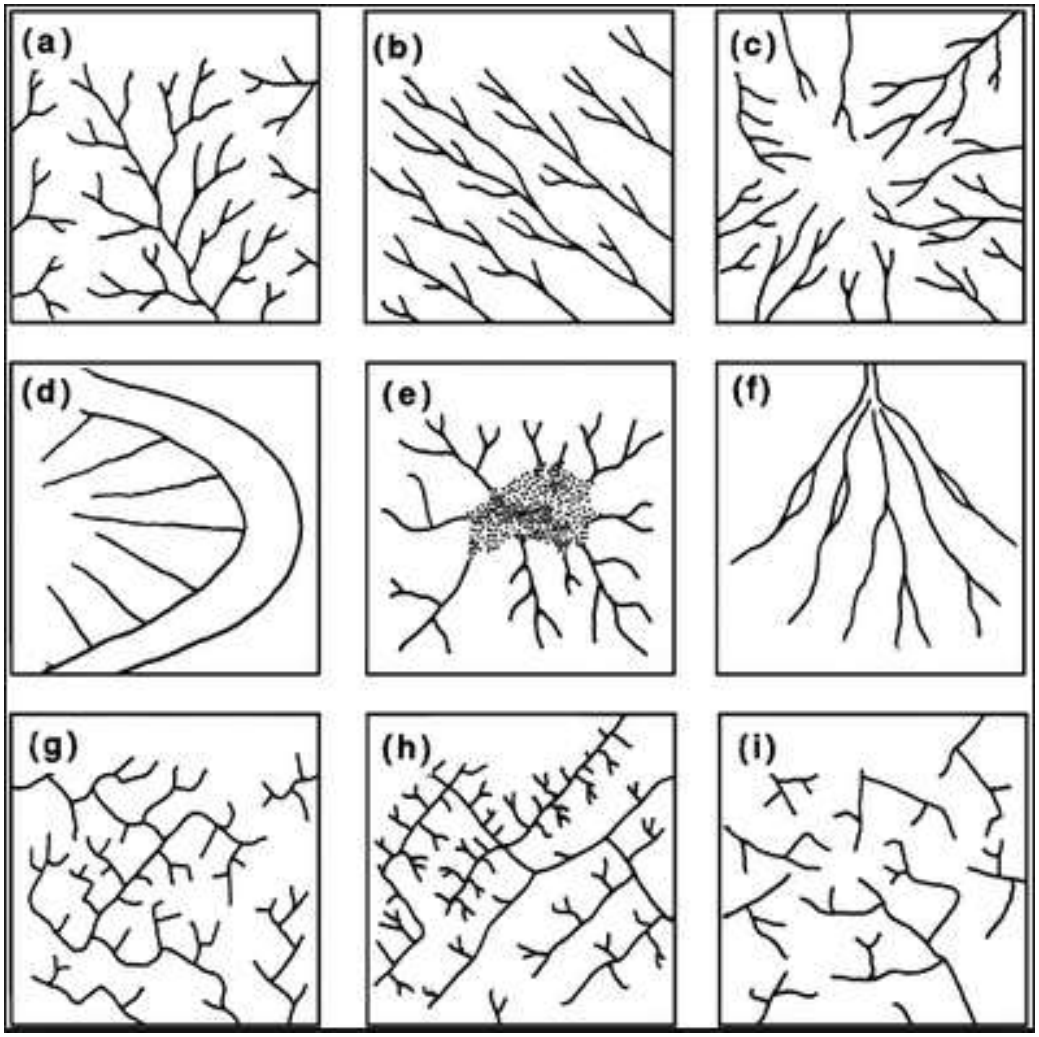
DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

4. Use the sketches above to complete the table below describing the three drainage patterns illustrated.

Sketch	Drainage Pattern Name	2 Characteristic of Drainage pattern	Underlying rock Structure
A			
B			
C			
	(3 x 1 = 3)	(3 x 2 = 6)	(3 x 2 = 6)

QUESTION 5: 12 minutes [15] ***(Set up according to CAPS)***

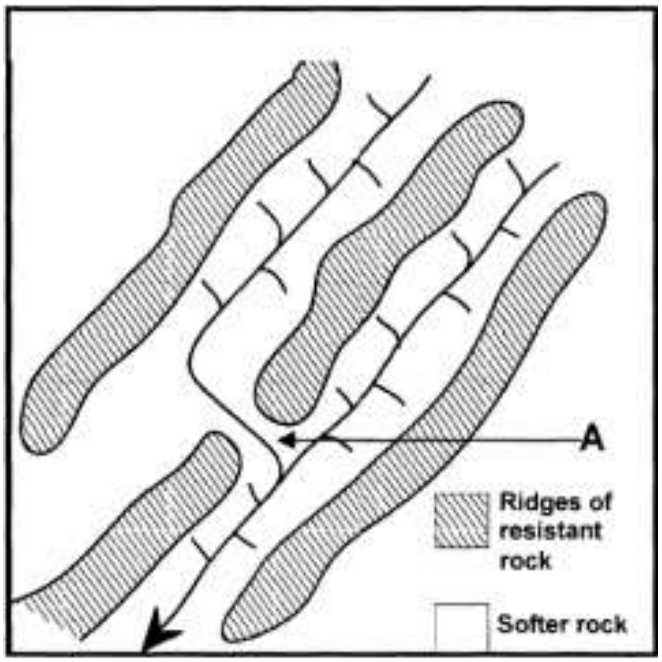


© Gauteng Department of Education

5. Use the sketches above to answer the questions below. Fit the most suitable sketch to the description below. *(HINT: Know your definitions and sketches)*

5.1. Dendritic drainage pattern
5.2. Centripetal drainage pattern
5.3. Trellis drainage pattern
5.4. Radial drainage pattern
5.5. Rectangular drainage pattern
5.6. Drainage pattern in volcanic crater
5.7. Drainage pattern on jointed dome,
5.8. Drainage pattern on very steep slopes.
5.9. Main stream have right angles in the stream
5.10. Tributaries join at right angles.
5.11. Drainage pattern on a Butte.
5.12. Drainage basin draining parallel ridges and valleys
5.13. Drainage pattern resembles the shape of a tree.
5.14. Tributaries join main streams at right angles.
5.15. Drainage pattern on uniformly resistant rock. (15 x 1 = 15)

QUESTION 6: 15 minutes [20] ***(Taken from NSC Prelim 2013 Paper 1)***



© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

HINT: Always read the question properly and answer it specifically what is asked.

6. Study the figure above illustrating a drainage pattern and answer the following questions.

6.1. Define the terms drainage basin, watershed and river system. (3 x 2 = 6)

6.2. How many drainage basins are illustrated on this sketch? (1 x 1 = 1)

6.3. a) Name the drainage pattern illustrated in the figure above. (1 x 1 = 1)

b) Give two characteristics evident from the diagram to proof why you identified the specific drainage pattern in 2.2.a. (2 x 2 = 4)

6.4. Identify the underlying rock structure that lead to the development of this drainage basin. (1 x 2 = 2)

6.5. a) What is the order of the stream at the arrow at the bottom of the sketch. (1 x 2 = 2)

b) Account for the low stream order at this point. (1 x 2 = 2)

6.6. Identify and describe the landform at A. (2 x 1 = 2)

QUESTION 7: 5 minutes [7] ***(Taken from NSC Prelim 2013 Paper 1)***

HINT: Always link flow characteristics to stages of rivers and erosive capacity)

7. Study the figure below illustrating the different types of flow in rivers.

7.1. The type of flow in river A is knows as …. and in river B as …..

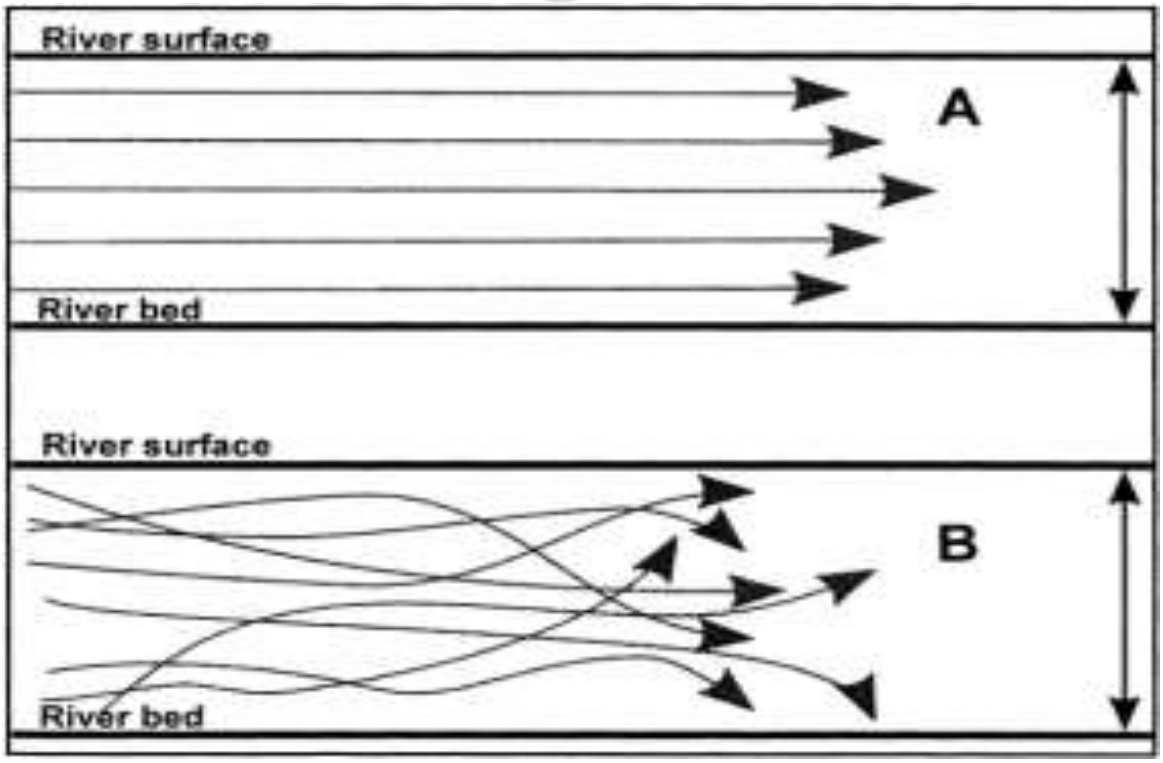
7.2. The type of flow in river (A/B) is associated with the lower course of a river.

7.3. The type of flow caused by obstruction on the riverbed occurs in diagram (A/B)

7.4. The highest stream velocity is associated with the flow in diagram (A/B).

7.5. The developments of rapids are associated with diagram (A/B).

7.6. River (A/B) will appear smooth on the surface. (7 x 1 = 1)



© Gauteng Department of Education

SESSION NO: 6 GEOMORPHOLOGY

TOPIC 6: FLUVIAL PROCESSES

SECTION B: NOTES ON CONTENT

TERMINOLOGY / DEFINITIONS

Cross / transverse rive profile	The profile through a width of river valley illustrating the width and depth of the valley
Longitudinal river profile	Profile along the length if a river form source to mouth
Base level of erosion	Lowest level to which a river can erode its valley. Sea – permanent bas level of erosion / Lakes, dams, waterfalls, rapids – temporary base levels of erosion.
Rejuvenation	River gains new energy due to faster flow and or increased volume and take on characteristics of the youth stage in the mature or old age stages.
Grade River	River with a perfect concave longitudinal profile, where there is a balance between the erosion and deposition in the river
Lateral erosion	Side ward erosion – widens the river valley
Headward erosion	Erosion at the sources of the river – lengthens the river valley
Downward erosion	Erosion cuts the valley deeper
Isostacy	Continental rising or sinking in comparison to sea-level due to erosion or ice cap melting.
Knick point	Sudden change in the gradient of a slope or a river profile e.g. rapids and waterfalls.

STUDY TIPS ETC

This section of work is easy and you can obtain good marks on conditions that you know your terminology and sketches. There are some processes involved in floodplain development and change which you must be able to identify and describe e.g. river rejuvenation. You need to know the stages of rivers very well and must be able to associate the stages with the cross and longitudinal profiles. It will be worthwhile studying this section well as there are always questions on this in the examinations.

© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

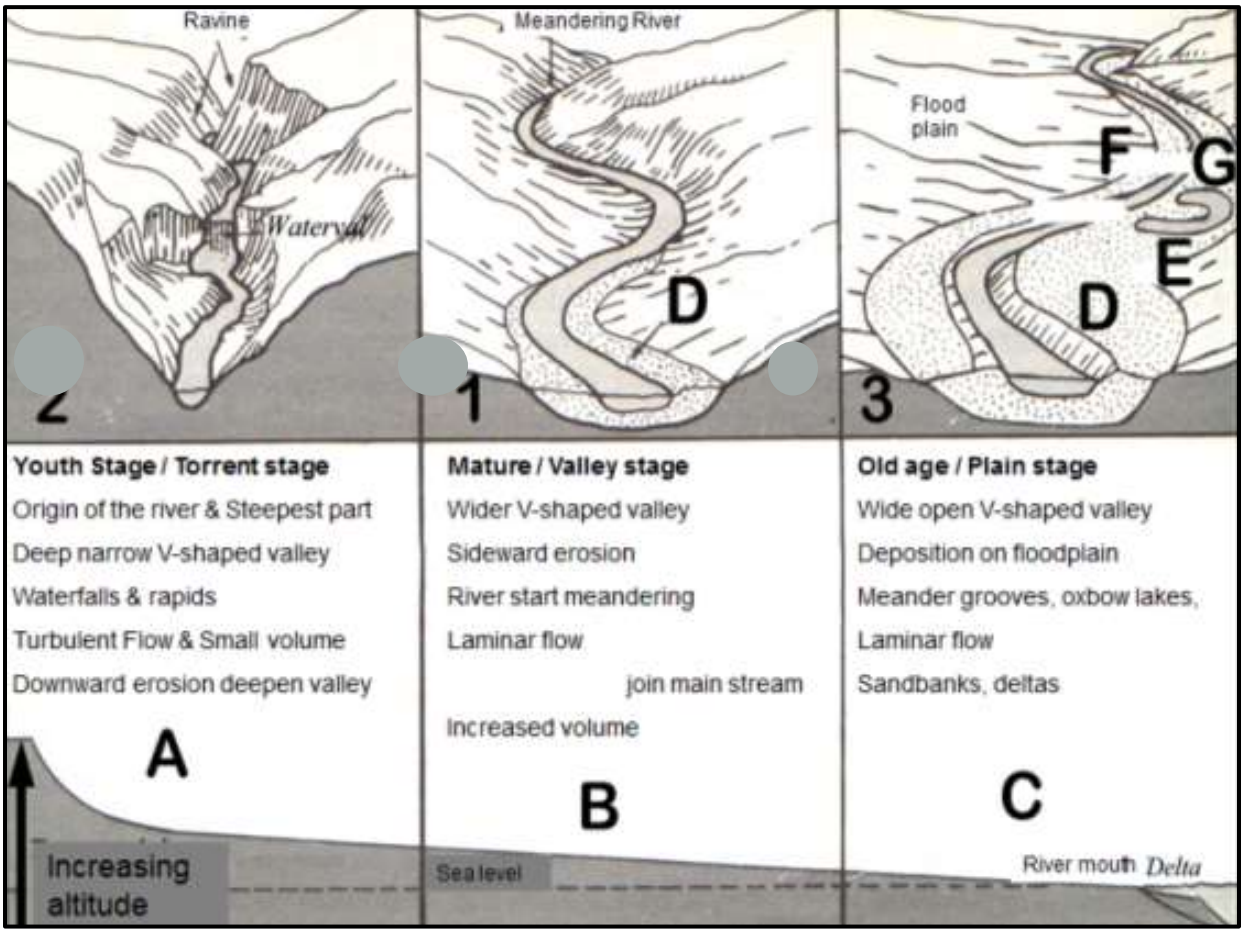
IMPORTANT CONCEPTS AND EXPLANATIONS

FLUVIAL PROCESSES

1. River profiles

1.1. Definition, description and associated characteristics

1.2. **Cross/Transverse profile:** the profile through a river valley differs from the upper course, through the middle to the lower course. The sketches below illustrate the cross sections through the three stages of the river.

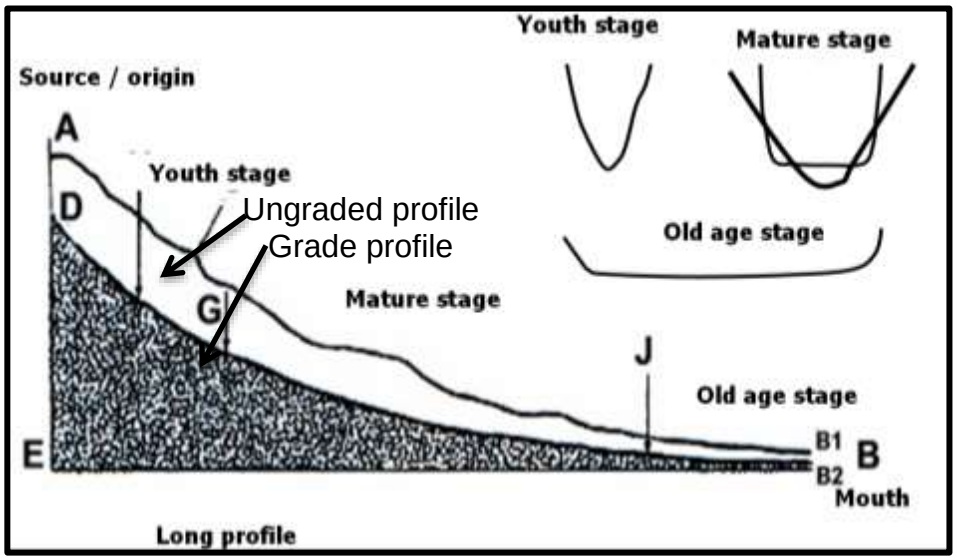


1.3. **Longitudinal profile:** refer to the view along the length of the river form the source to the mouth. The sketch above illustrates the longitudinal profile in every stage of the river. The cross profiles change as the river becomes more gradual downstream.

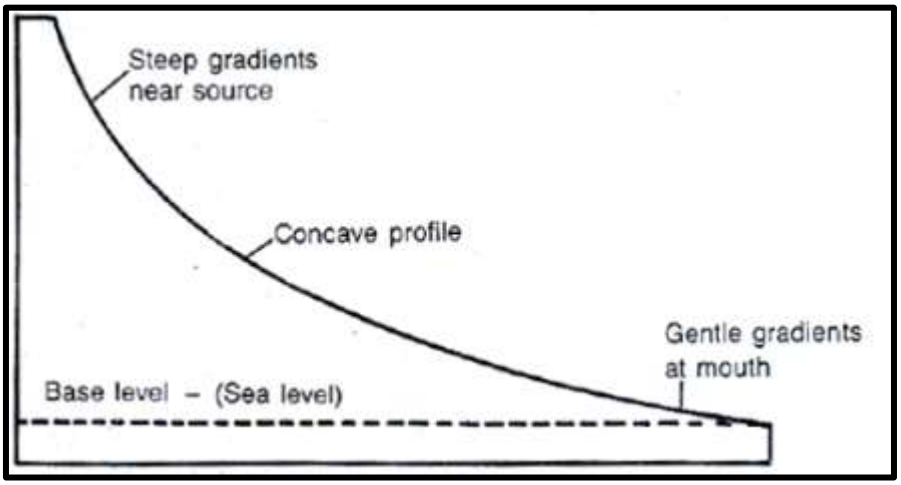
1.4. Relationship of both profiles to the stages of a river is illustrated by the sketches below.
The upper course has a steep longitudinal profile and a narrow deep cross profile.
In the middle course the river flows over a more gradual gradient and the cross profile is a wide open v-shaped valley.
In the lower course the longitudinal profile is very gradual and the cross profile take on the shape of a flat open valley as a floodplain developed.

© Gauteng Department of Education

The long profile and cross profiles of a river in different stages of the river.



2. River grading



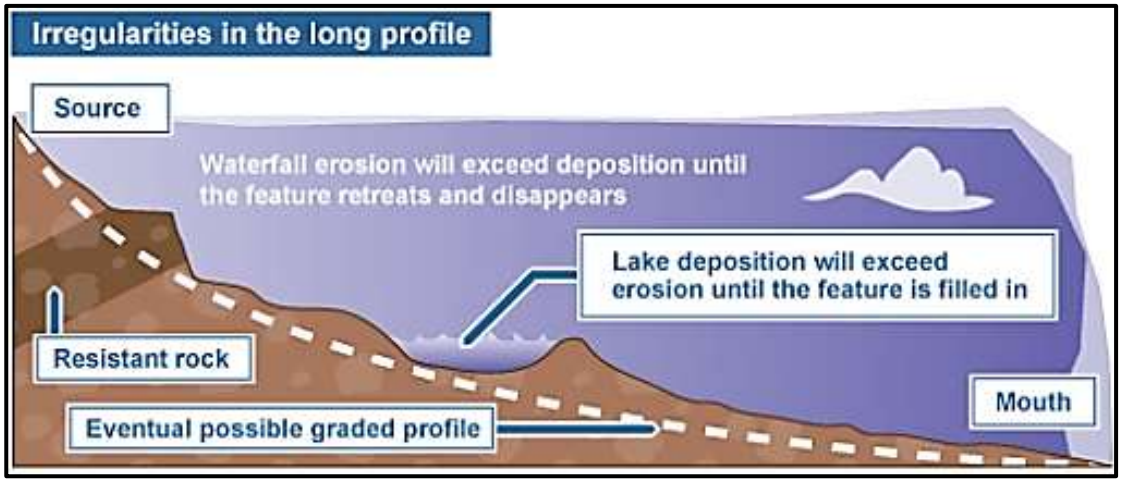
2.1. Distinguish between graded and ungraded streams

A river is graded when it has a perfect concave longitudinal profile as the sketch above illustrates. There is a balance between the erosions and deposition in the river. When there is an imbalance along the profile a temporary base level of erosion will develop in the form of waterfall, dam, lake or rapids. The river will always try to return to a graded profile. The sketch illustrating the long profile and cross profiles also illustrates an ungraded and a newly graded profile.

© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM



http://www.alevelgeography.com/wp-content/uploads/2013/11/inc.gif

2.2. Base level of erosion refers to level to which a river can erode its valley.

2.2.1. Temporary base level of erosion – these are knick points along the longitudinal river profile that halts erosion above this point the river cannot erode the valley lower that this feature until it is removed by erosion e.g. rapids, waterfall, dams and lakes are all examples of temporary base levels of erosion.

2.2.2. Permanent base level of erosion: the sea is the lowest level to which a river can erode is valley. Sea-level is the permanent base level of erosion.

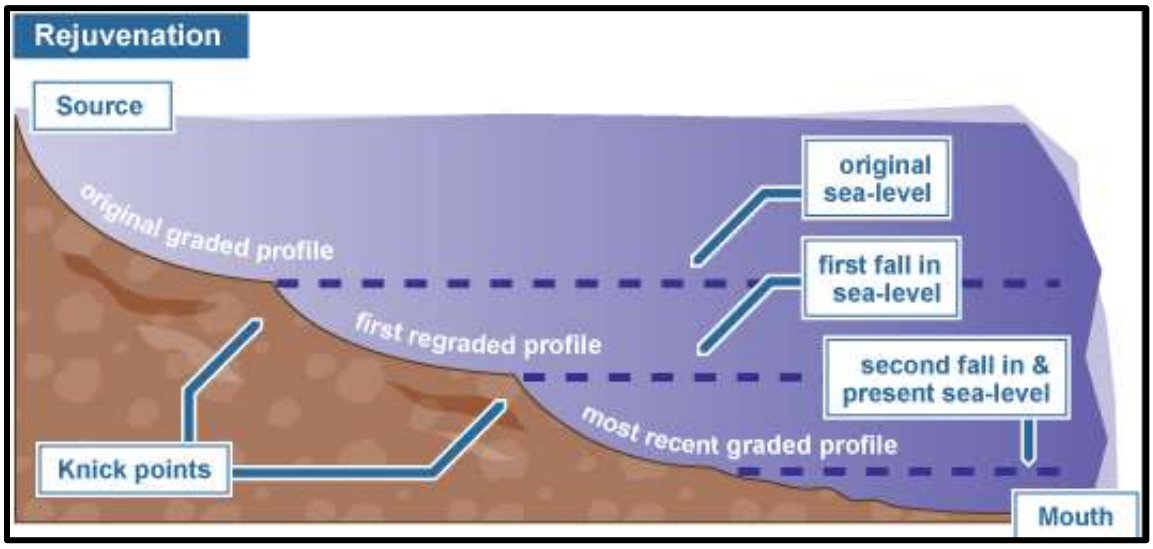
3. River rejuvenation

River rejuvenation takes place when the mature or lower course of a river takes on characteristics of the youth stage.

3.1. Reasons for rejuvenation

This happens when the river has renewed erosive power due to

- increased rainfall due to climate change or melting ice caps
- river capture where the captor stream gains more water
- Isostatic lift of continents where the last part of the river is then higher than sea level and there is an increase gradient at the river mouth.



© Gauteng Department of Education

3.2Features of rejuvenation

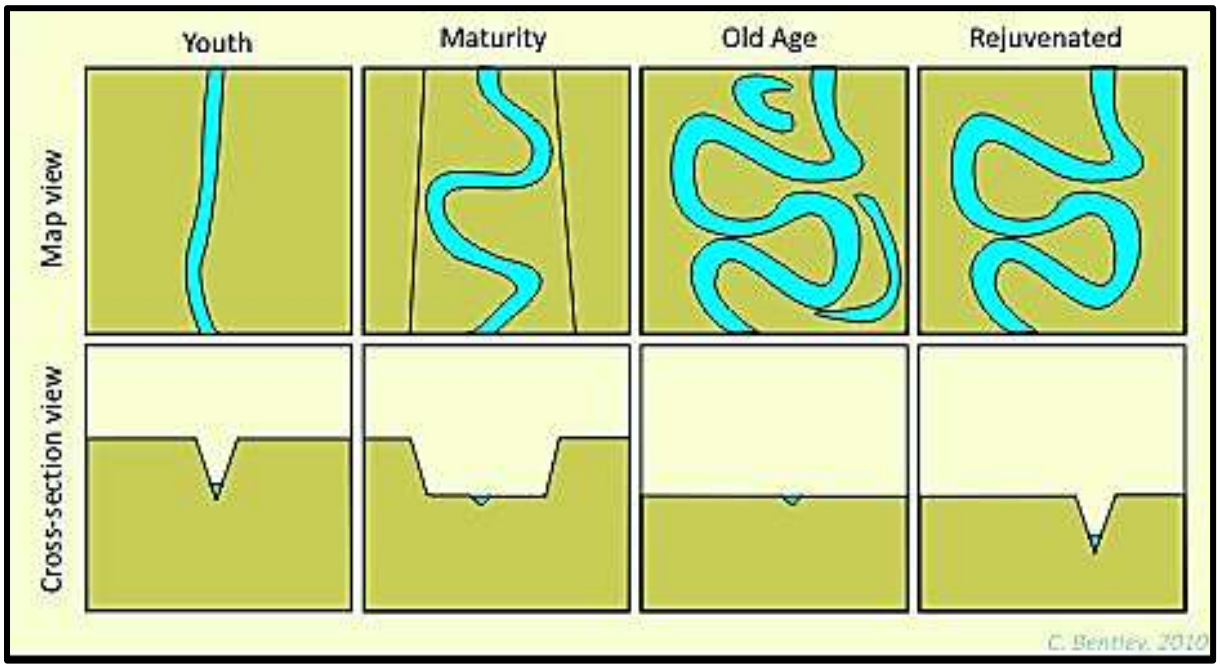
The river cuts its valley deeper and terraces, entrenched / incised meanders and knick points develop along the stream profile. The river needs to grade itself again. Most of the rivers along the East coast of South Africa have been rejuvenated as the sub-continent is rising due erosion that is making the continent lighter.

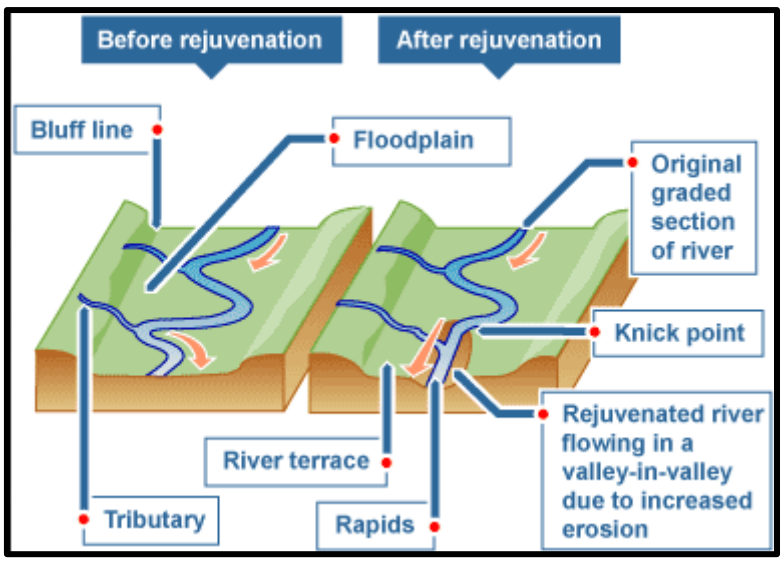
3.1.1. Knick point: sudden change in gradient along a river profile

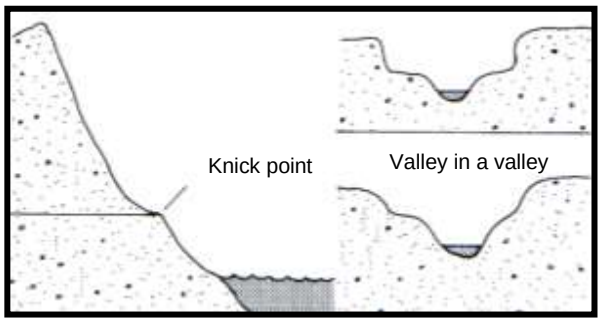
3.1.2. Terraces: step like feature that develop along the valley of a rejuvenated river due to increased downward erosion.

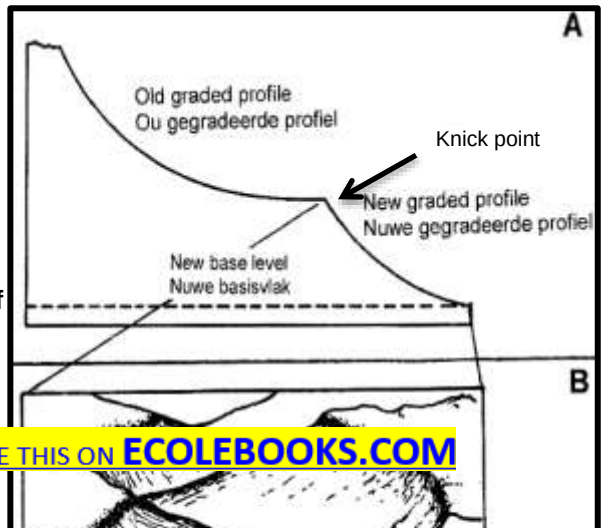
3.1.3. Valley in a valley: The new downward erosion cuts a new smaller valley into the older wider valley.

3.1.4. Incised/entrenched meanders: Meanders which usually develop on floodplains are now cut deep into the valley as downward erosion causes incision of the features as they are.









© Gauteng Department of

GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

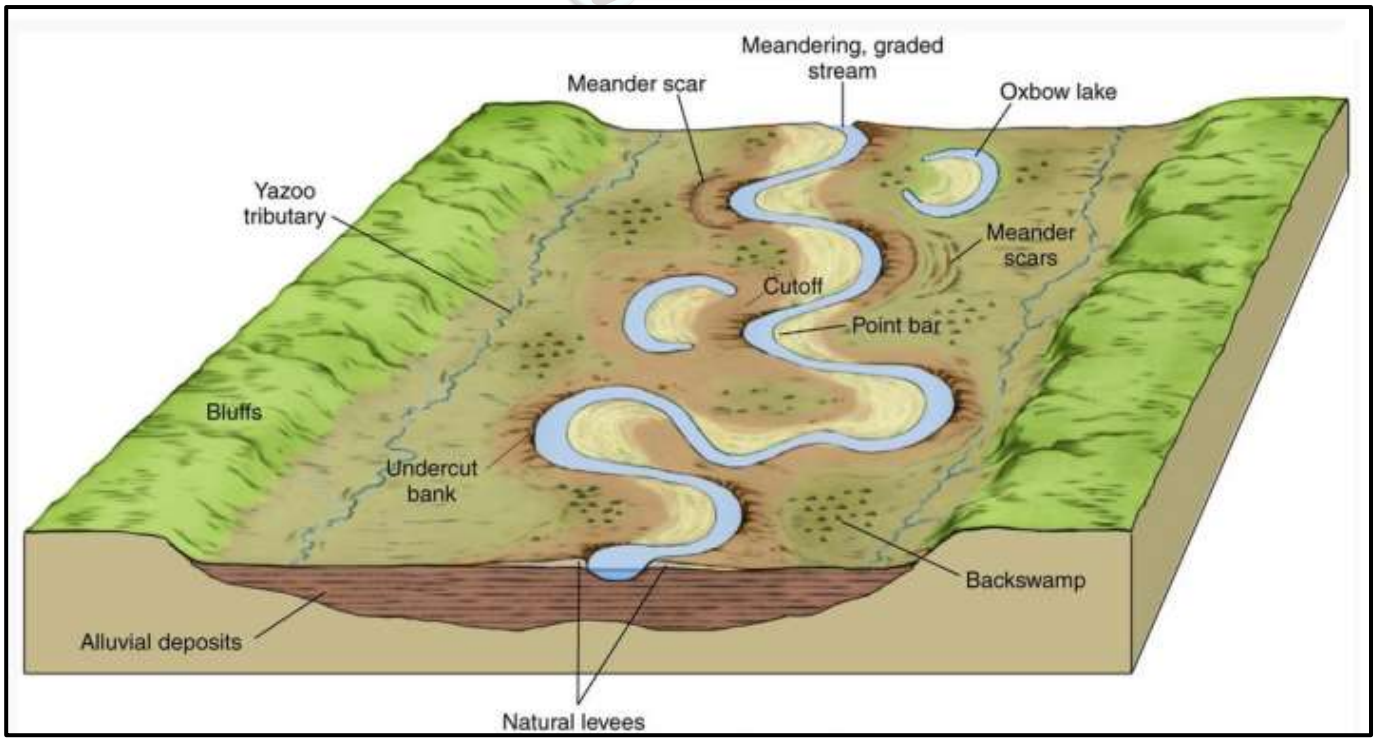
Incised meander

http://alevelblogger.blogspot.com/2013/05/river-rejuvenation-incised-meanders_7.html

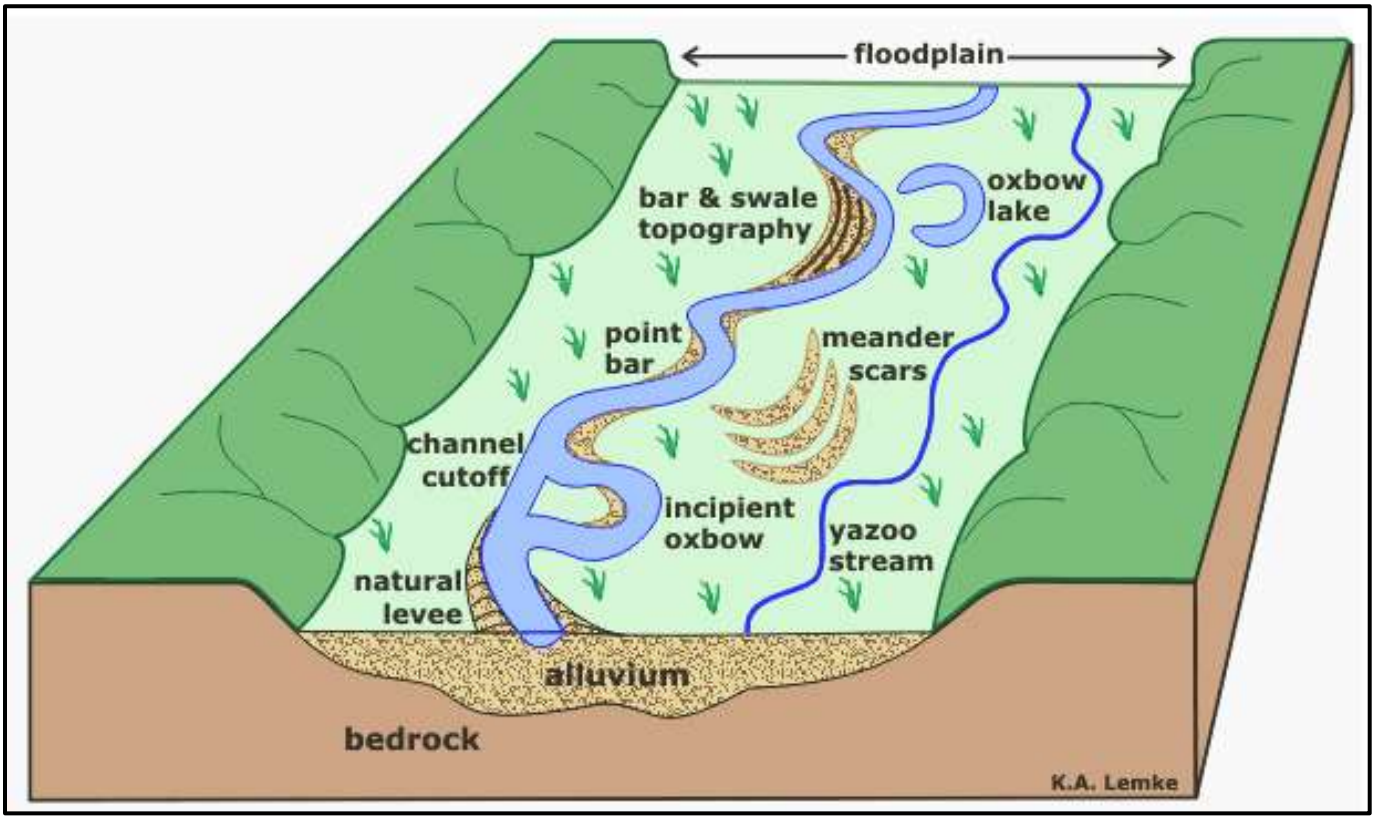
4. Identification, description and formation of fluvial landforms

Rivers have many features along their course. Some landforms develop due to erosion e.g. valleys, waterfall, rapids, river channels etc., while some develop due to deposition e.g. deltas, sandbanks, floodplains oxbow lakes, natural levees and river banks. The following two sketches illustrate landforms that develop in the mature and old age stages of rivers.

ÉcoleBooks



© Gauteng Department of Education

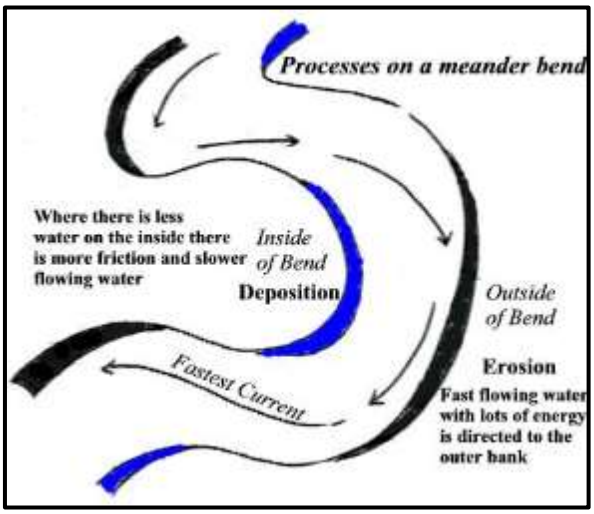


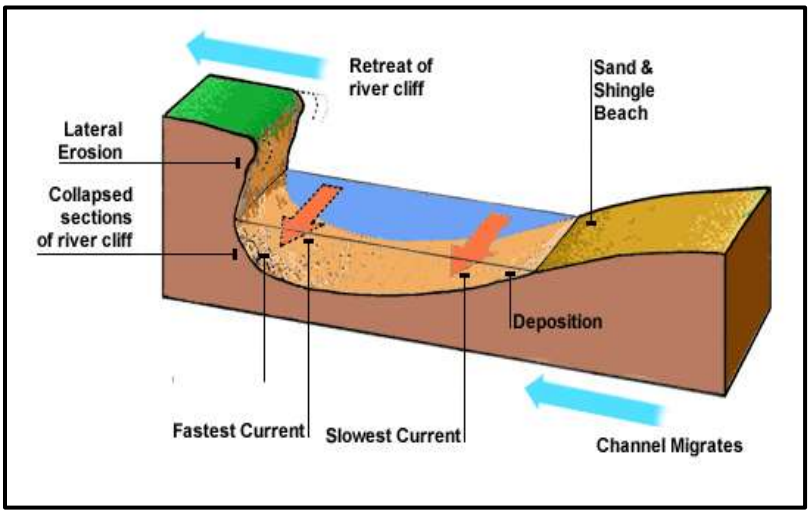
http://thebritishgeographer.weebly.com/river-landforms.html

4.1. Meander: this is a bend in the river channel that develops in the mature stage when the river has a larger volume and starts flowing slower. Meanders cause lateral (sideward) erosion which widens the river valley to form a flood plan later.

4.1.1. Undercut slope: The outer bank of the meander is called the undercut slope or undercut bank. The faster flow along the outer bend leads to more erosion to causes undercutting.

4.1.2. Slip-off slope: The inner bank of a meander is called the slip-off slope. Water flow slower along the inner bend and this lead to deposition and the river being shallower here.



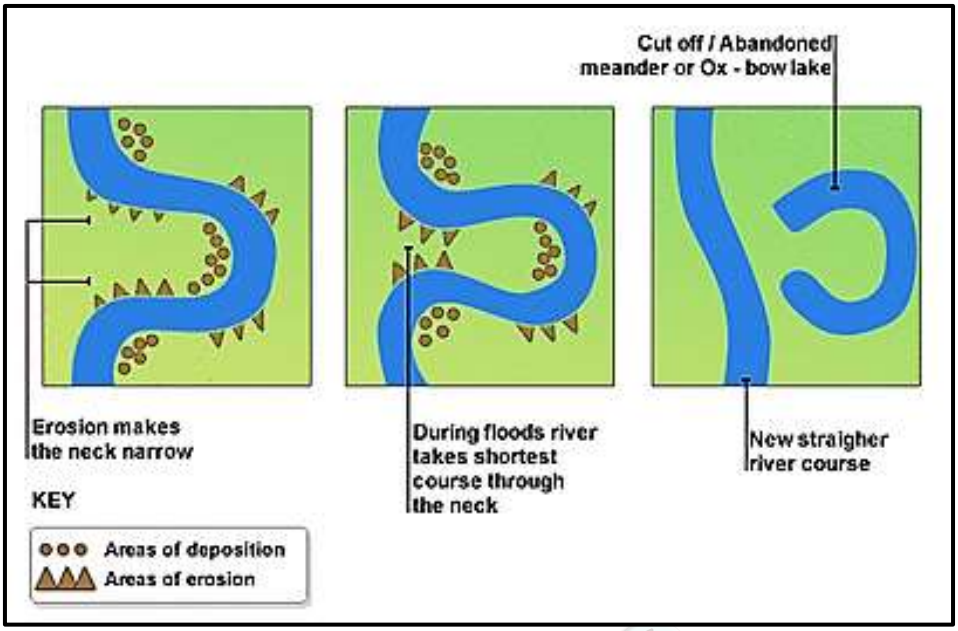


© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

4.2. Oxbow lakes: develop when the neck of a meander is cut narrower until erosion cuts through the neck. The river takes the new shorter straight rout and the old meander is cut off from the main stream. Deposition fills the entrances to this bend and this is known as an oxbow lake. Over time deposition during flooding will fill up the oxbow lake and only a meander scar will be left on the floodplain.

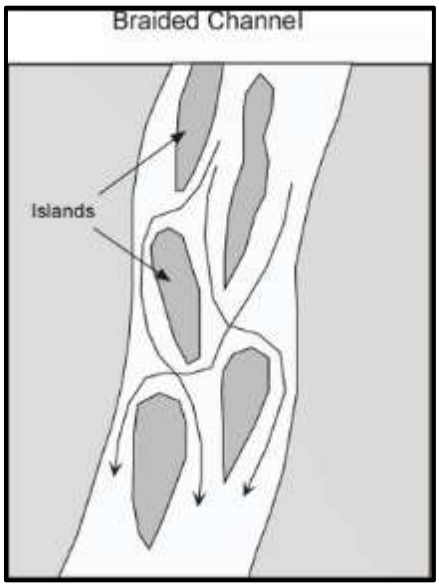



Meanders on the Kanuti River, Alaska, USA

http://chubbyrevision.weebly.com/river-landforms.html

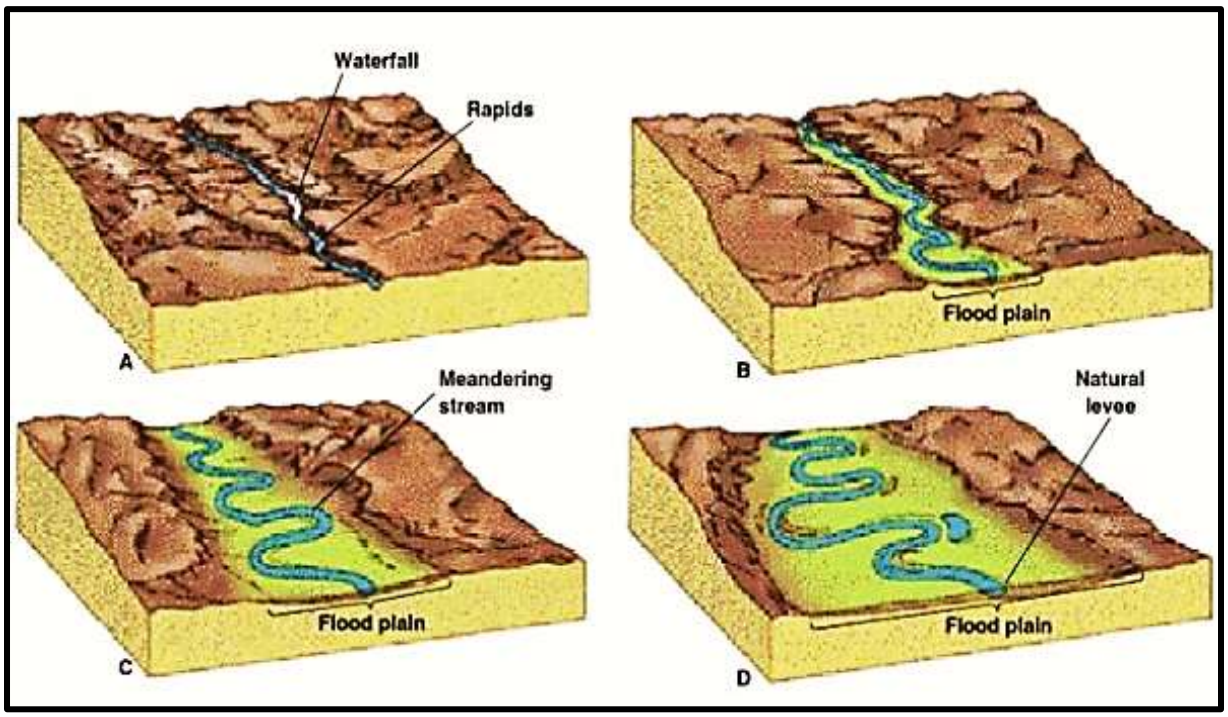
4.3. Sand islands develop where rivers carrying a lot of sand, flow slower and onto gradual slopes. The river deposits its load and sand islands form in the river channel.

4.4. Braided streams develop where the river blocks itself with sand and then it splits around the sand islands forming many smaller streams. The sketch and photo below illustrates sand islands and braided streams.

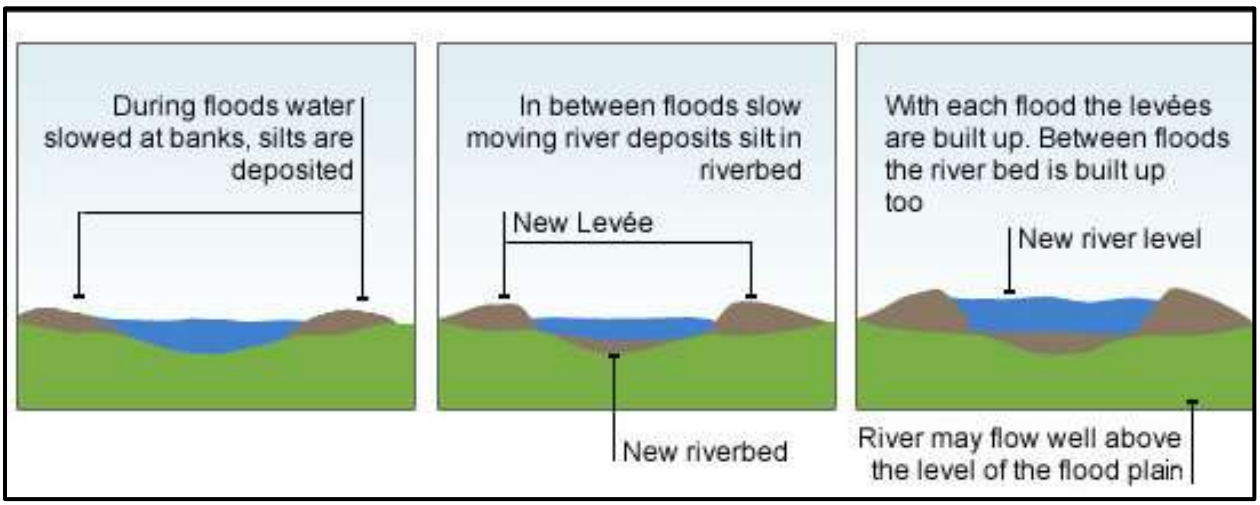


© Gauteng Department of Education

4.5. Flood plain develop as the river erodes the valleys first lower through downward erosion in the upper stages (sketch A) and then wider through lateral erosions in the middle stage (sketches B & C). Deposition in the old age stage forms a fertile floodplain (sketch D).



4.6. Natural levees: develop along the river channel on the banks of the river. Each time the river floods its banks it deposits alluvium (material carried by rivers) on the banks building it higher. Later on the river builds up natural levees which reduce flooding.



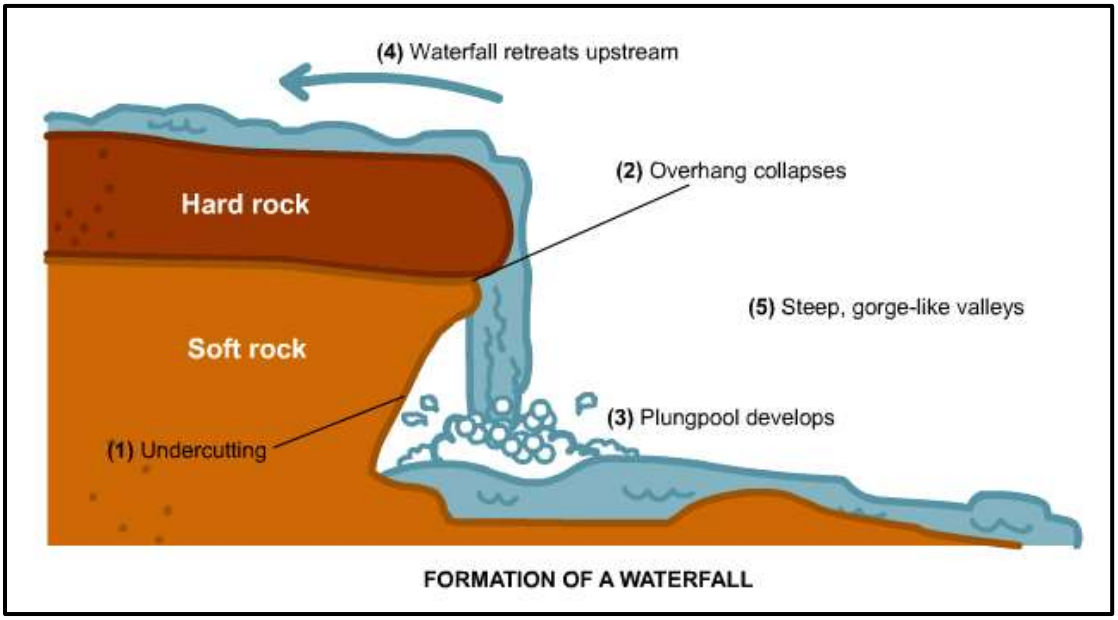
http://www.bbc.co.uk/bitesize/standard/geography/rivers/river_forming/revision/3/

© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

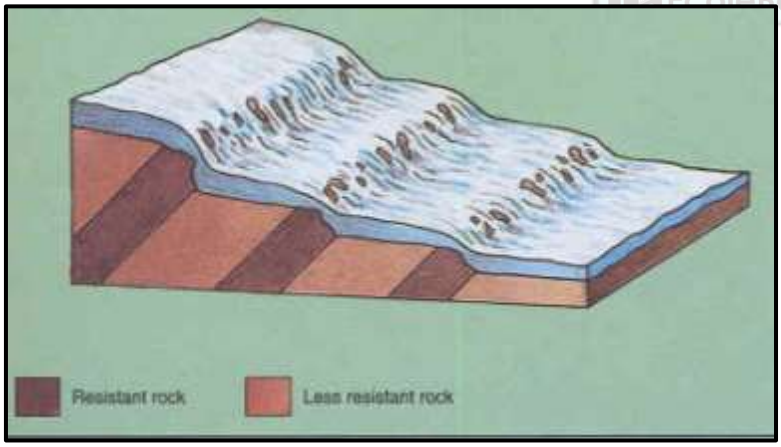
4.7. Waterfalls: develop in the river channel where there is a hard rock layer which resists erosion covering softer rock. The river cuts the softer rock away quickly but the hard rock erodes slowly forming a vertical drop over which the water falls. Waterfalls often occur in the youth stage and where rejuvenation took place in a river system.



FORMATION OF A WATERFALL

http://www.kwiznet.com/p/takeQuiz.php?ChapterID=10653&CurriculumID=41&Num=3.2

4.8. Rapids: develop where the gradient of a river suddenly increases and this cause the water to flow turbulently giving it a white colour.



4.9. Deltas: Develop where rivers mouth out into the sea and they deposit their entire load onto a shallow seafloor.

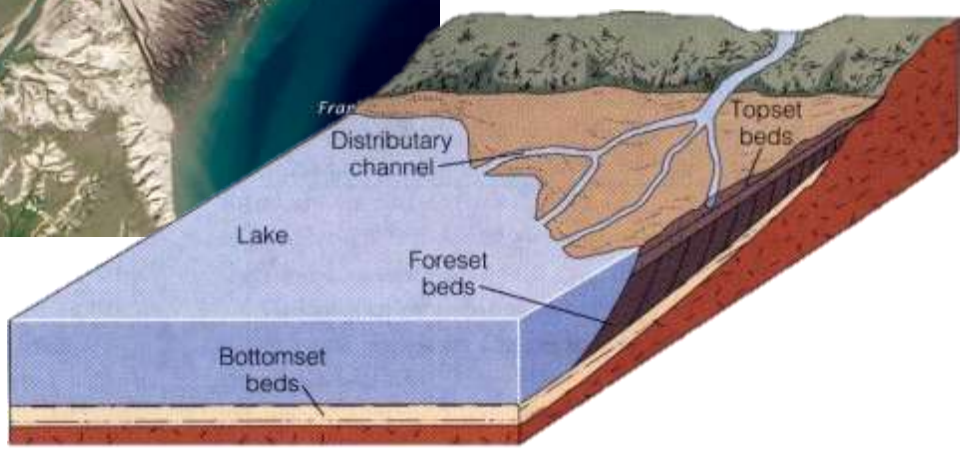
Deltas only develop in river mouth where the

- river has a large amount of stream load,
- the seafloor is shallow and
- seafloor not sinking and
- Where the current past the mouth is not strong enough to wash all the alluvium away.

© Gauteng Department of Education

A satellite image of a Delta in the Horton River mouth in Canada

Delta formation



http://earthobservatory.nasa.gov/IOTD/view.php?id=79044

http://blank005.tripod.com/geology/graphic/runningwater/runningwater09.jpg

4.10. Utilisation of fluvial landforms by humans

Stage	Landforms / Characteristics	Usages
Upper course	Waterfalls, rapids, deep valleys, turbulent flow, downward erosion, steep slopes	Adventure / eco-tourism - river rafting, abseiling, Kloofing (jumping down waterfalls), Building of small dams, generating hydroelectricity
Middle course	Larger open valley, larger volume, more gradual slope, meanders, ox bow lakes, floodplain start developing	Dams, transport routes, farming, irrigation building of settlement, tourism, hydro-electrical.
Lower Course	Floodplains, meanders, yazoo streams, ox bow lakes, sand islands, deltas, large volume, fertile alluvial plain, lots of deposition, gradual slope, large levees.	Agriculture, irrigation on fertile flat plains, settlement, transport routes, tourism.

© Gauteng Department of Education

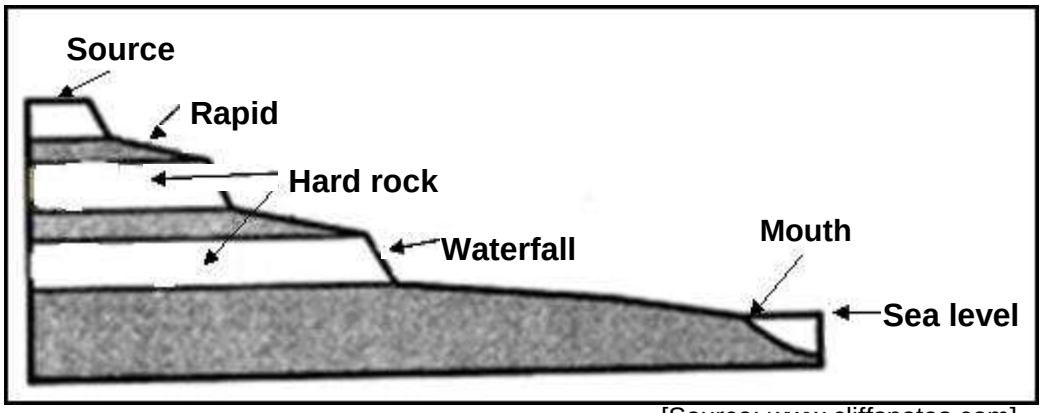
DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

SECTION B: TYPICAL EXAM QUESTIONS

FLUVIAL PROCESSES

FIGURE 1.1: LONGITUDINAL RIVER PROFILE (NOVEMBER 2014)



[Source: www.cliffsnotes.com]

FIGURE 1.1 shows a longitudinal river profile.

1.1.1 Explain the term *longitudinal profile*. (1 x 1) (1)

1.1.2 Name a temporary base level of erosion evident on the sketch. (1 x 1) (1)

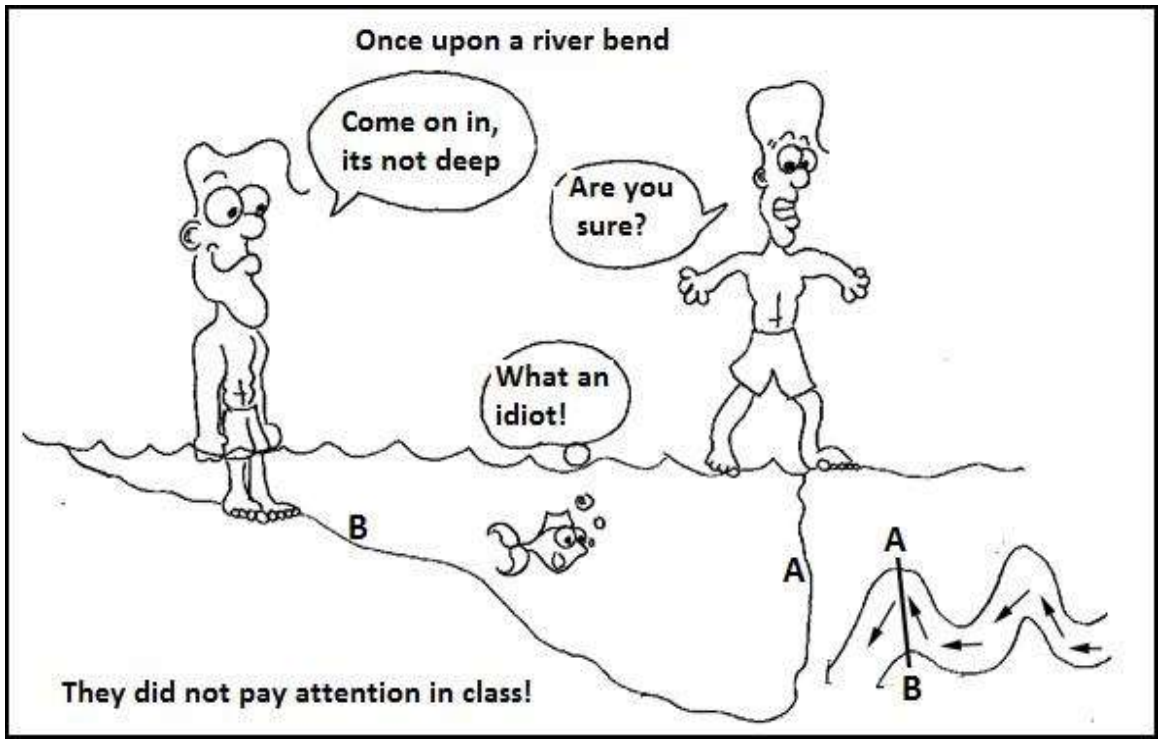
1.1.3 Draw a labelled free-hand sketch of a graded longitudinal profile. (1 x 3) (3)

1.1.4 State ONE characteristic of the river bed of a graded river. (1 x 2) (2)

1.1.5 In a paragraph of approximately EIGHT lines, explain the

© Gauteng Department of Education

FIGURE 1.2 : RIVER BEND (FEBRUARY/ MARCH 2015)



1.2 Refer to FIGURE 1.2 showing a river bend.

1.2.1 What term is used to describe a river channel that winds and bends (1 x 1) (1)

1.2.2 Name TWO dimensions of a river that are visible in the cross- profile (2 x 1) (2)

1.2.3 Name the slope of the river at **B**. (1 x 2) (2)

1.2.4 Why does the fish think that both boys are idiots? (1 x 2) (2)

1.2.5 In a paragraph of approximately EIGHT lines, give a detailed explanation to account for the difference in the formation of slope **A** and slope **B**. (4 x 2)

© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

FIGURE 1.3: RIVER REJUVENATION (NOVEMBER 2014)

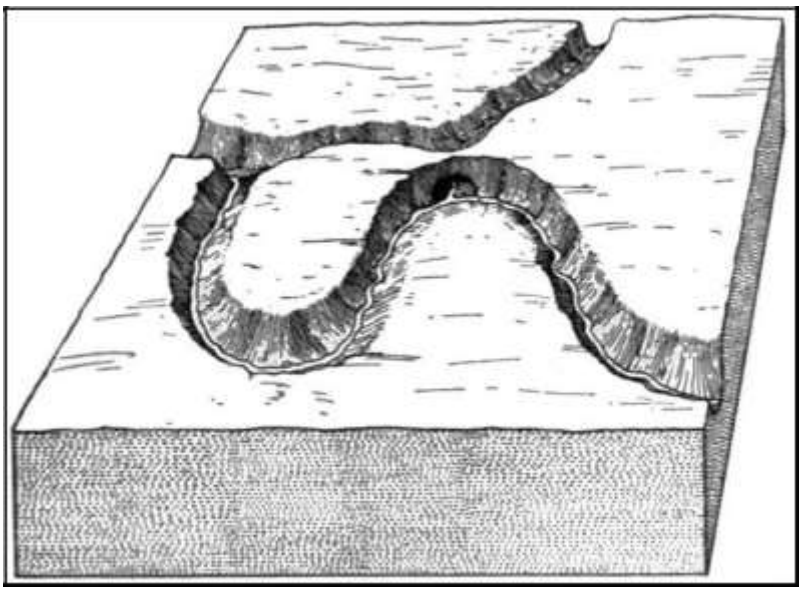


FIGURE 1.3 illustrates the concept of river rejuvenation.

1.3.1 Define the term *river rejuvenation*. (1 x 1) (1)

1.3.2 Identify the feature of river rejuvenation evident in the illustration. (1 x 1) (1)

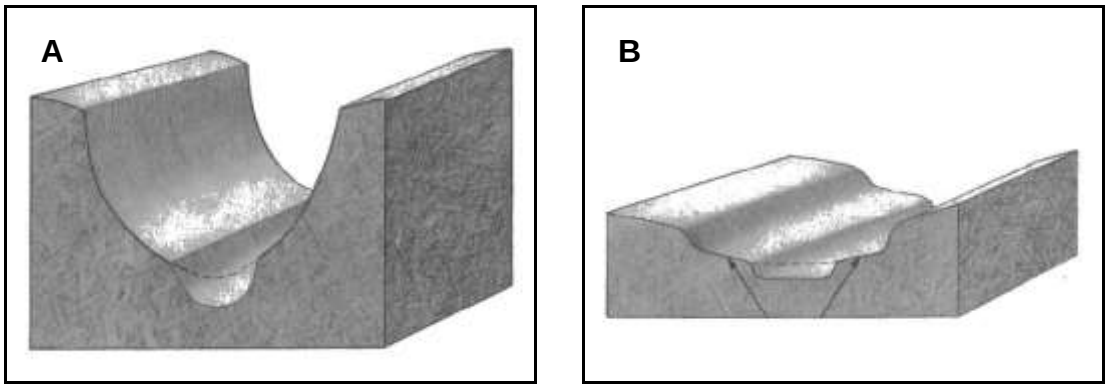
1.3.3 State TWO conditions under which river rejuvenation is likely to take place. (2 x 2) (4)

1.3.4 Explain how the feature in QUESTION 2.6.2 is formed. (2 x 2) (4)

1.3.5 Explain why the landscape in FIGURE 2.6 is not suitable for infrastructure development. (2 x 2) (4)

© Gauteng Department of Education

FIGURE 1.4: FEATURES OF RIVER REJUVENATION (JUNE 2015)



[Source: *Senior Geography*

Refer to FIGURE 1.4 which shows features of river rejuvenation.

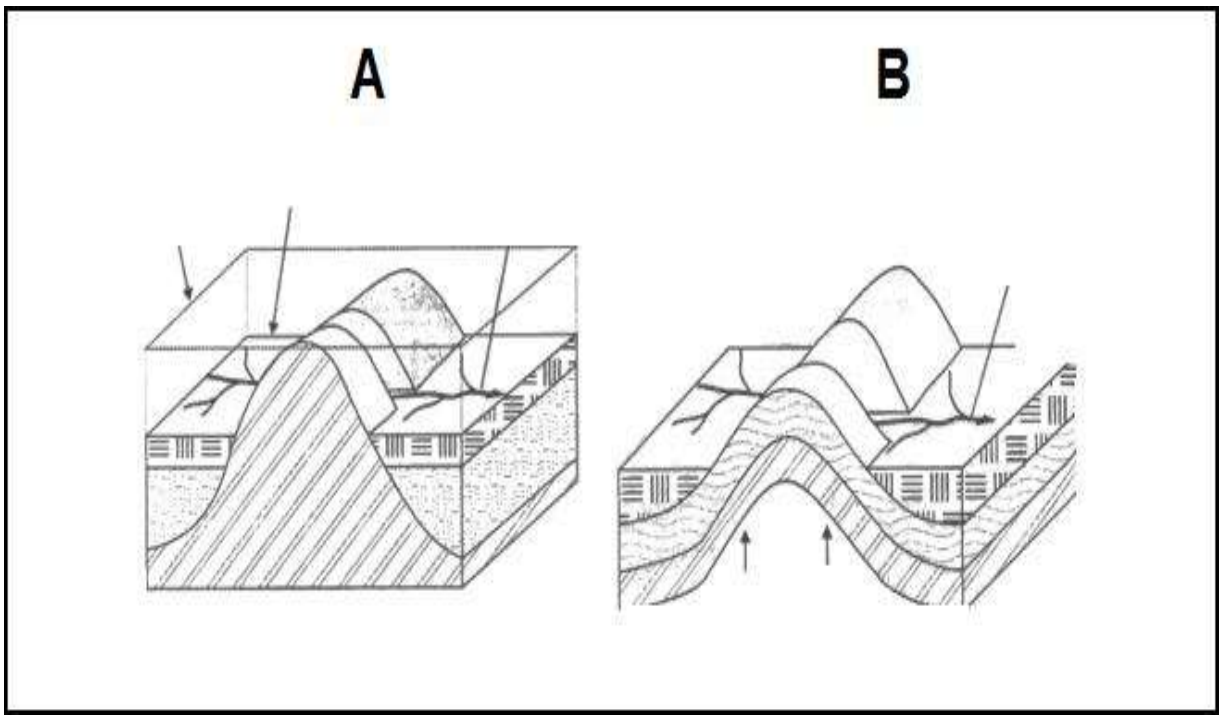
1.4.1	Define the term *river rejuvenation.*	(1 x 1)	(1)
1.4.2	Identify the features of rejuvenation in diagrams **A** and **B**.	(2 x 1)	(2)
1.4.3	What does a knickpoint indicate along the course of a rejuvenated river?	(1 x 2)	(2)
1.4.4	State the impact of river rejuvenation on the cross-profile of a river.	(1 x 2)	(2)
1.4.5	Explain why a gorge develops where a river is rejuvenated.	(2 x 2)	(4)
1.4.6	Explain why rejuvenated rivers attract tourists.	(2 x 2)	(4)

© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

FIGURE 1.5: SUPERIMPOSED AND ANTECEDENT DRAINAGE PATTERNS (JUNE 2015)



1.5 Study FIGURE 1.5 which shows superimposed drainage (**A**) and antecedent drainage (**B**).

1 Distinguish between *superimposed drainage* and *antecedent drainage*. (2 x 1) (2)

1.5.2 Give ONE reason why superimposed drainage does not change its course. (1 x 2) (2)

1.5.3 Name ONE unique feature associated with the flow patterns of superimposed and antecedent drainage. (1 x 2) (2)

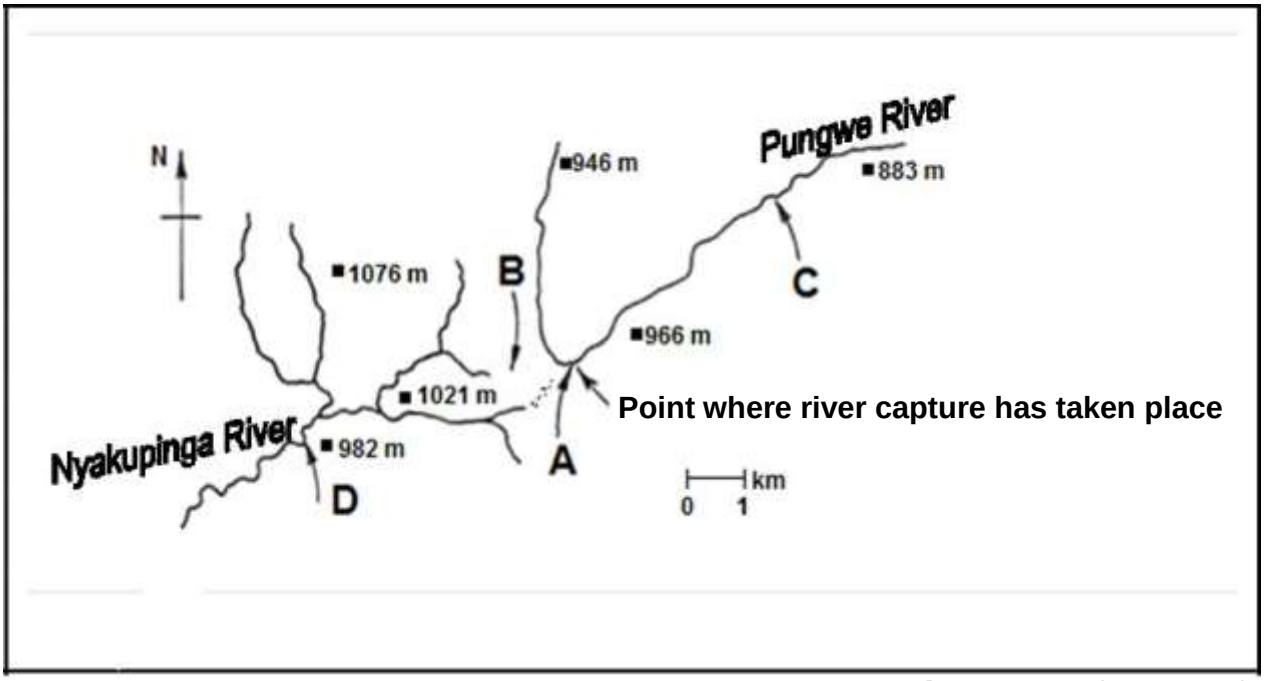
1.5.4 Identify the tectonic force associated with the uplift of the surface evident in diagram **B**. (1 x 2) (2)

1.5.5 Give the relationship between the rate of down cutting and tectonic uplift in antecedent drainage. (1 x 2) (2)

1.5.6 Explain why the illustrated landscapes are not suitable for human habitation. (2 x 2) (4)

© Gauteng Department of Education

FIGURE 1.6: RIVER CAPTURE NEAR PUNGWE GORGE (JUNE 2015)



[Source: Examiner's own sketch]

1.6 Refer to FIGURE 1.6 showing a simplified sketch of river capture near the Pungwe Gorge in Mpumalanga.

1.6.1 Match the following features of river capture to letters **A**, **B**, **C** or **D**:

(a)	Misfit/Beheaded stream	(1 x 1)	(1)
(b)	Wind gap	(1 x 1)	(1)
(c)	Elbow of capture	(1 x 1)	(1)

1.6.2 State ONE characteristic of the misfit/beheaded stream. (1 x 1) (1)

1.6.3 Explain how river capture has led to the rejuvenation of the Pungwe River. (2 x 2) (4)

1.6.4 In a paragraph of approximately EIGHT lines, describe the negative impacts of river capture on people living along the banks of the Nyakupinga River (4x2) (8)

© Gauteng Department of Education

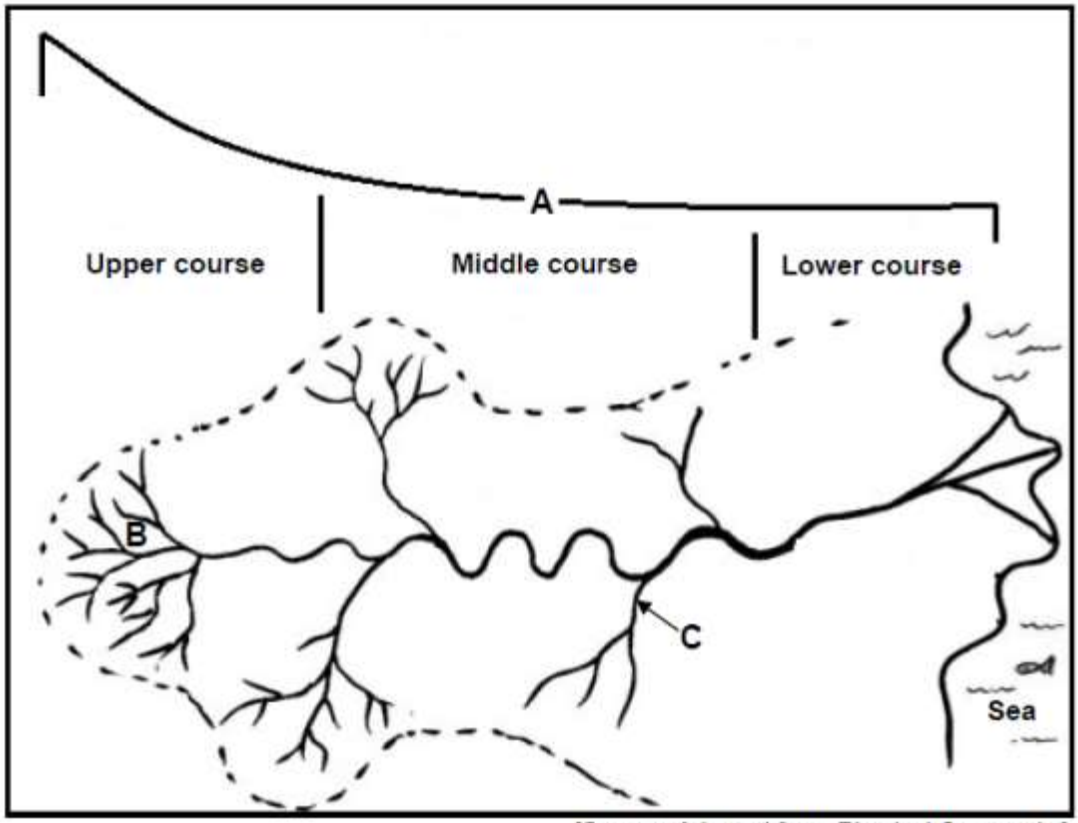
DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

SECTION C: HOMEWORK QUESTIONS ON FLUVIAL PROCESSES

QUESTION 1: 18 minutes [22] ***(Taken from NSC Nov 2013 Paper 1)***

FIGURE DRAINAGE BASIN AND ITS LONGITUDINAL PROFILE



[Source: Adapted from *Physical Geography*]

HINT: This question integrates stages, drainage pattern and rock structure.

1. The FIGURE above is based on a drainage basin and its longitudinal profile.

1.1. Define the term drainage basin. (1 x 2) (2)

1.2. Explain the term longitudinal profile. (1 x 2) (2)

1.3. What evidence suggests that the longitudinal profile is a graded profile? (1 x 2) (2)

1.4. Name and describe the underlying rock structure associated with stream pattern B. (2 x 2) (4)

1.5. Determine the stream order at point C. (1 x 2) (2)

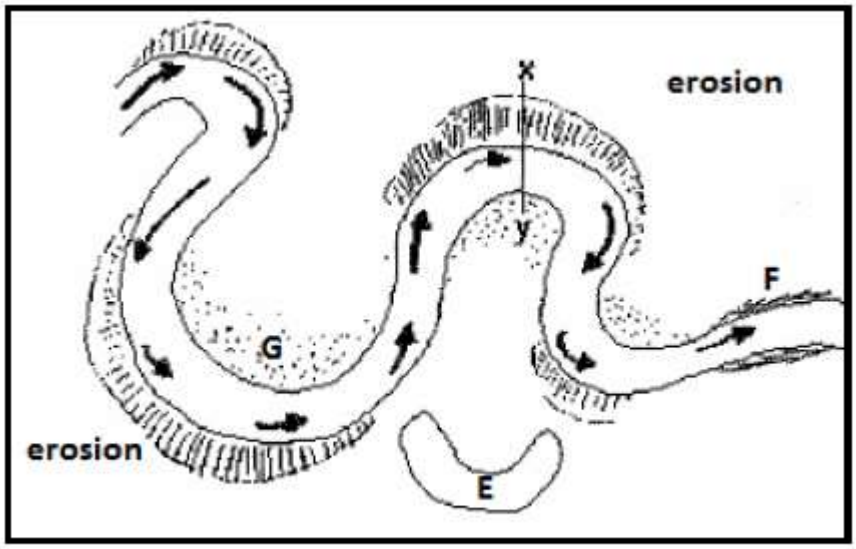
1.6. Give a reason why the river follows a meandering path in the middle course. (1 x 2) (2)

1.7. The fluvial landforms in the upper and lower course of a river differ greatly. Write a paragraph (approximately 12 lines) in which you explain how the different stream-flow and erosion processes are responsible for the development of different landforms in the upper and lower courses. (4 x 2) (8)

© Gauteng Department of Education

QUESTION 2: 12 minutes [15] ***(Taken from NSC March 2012 Paper 1)***

HINT: Menders and oxbow lakes must be linked to cross profiles of rivers



Adapted from Ocr.revision

2. Study the figure above which shows fluvial features. Choose the correct word(s)/term(s) from those given in brackets. Write only the word(s)/term(s) next to the question number (2.1.1–2.1.5) in the ANSWER BOOK.

2.1. Name the slope that forms on the river labelled **X**.
(Undercut slope/Scarp slope)

2.2. The name of the slope labelled **Y**. (Dip slope/Slip off slope)

2.3. Feature **E** that forms when a meander loop is cut off.
(Oxbow lake/Meander neck)

2.4. Deposits (**F**) that occur on the banks of a river. (Silt/Scree)

2.5. Area adjacent to the river that floods (**G**) when a river overflows its banks. (Levee/Flood plain) (5 x 1) (5)

2.6. Explain how the meanders contributed to the formation of the floodplain. (2 x 2) (4)

2.7. Explain how the landform labelled E developed. (3 x 2) (6)

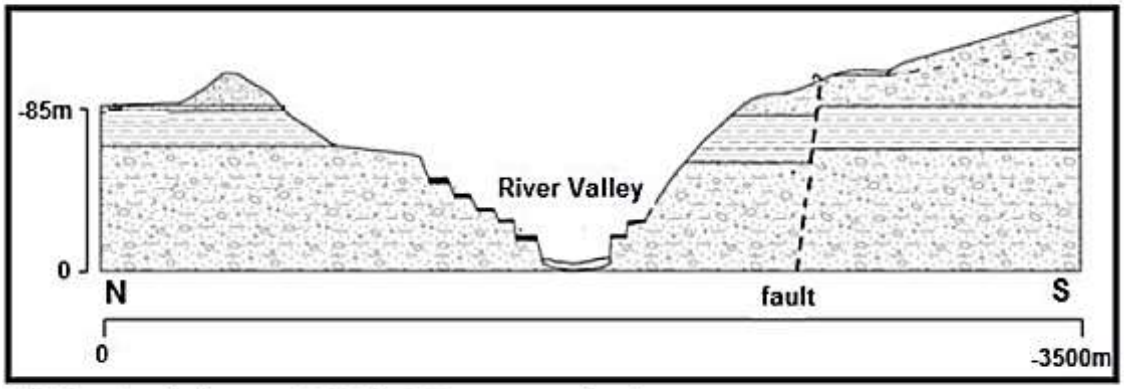
© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

QUESTION 3: 16 minutes [20] ***(Taken from NSC Nov 2012 Paper 1)***

FIGURE SIDE VIEW OF A RIVER VALLEY



[Adapted from *GCSE Geography*]

HINT: Know the geomorphological processes well. Know sketches and steps.

3. Refer to the FIGURE above which shows a river profile and answer the questions that follow.

3.1. What type of river profile is shown here? (1 x 2) (2)

3.2. Name TWO dimensions of a river that can be seen in the illustrated river profile. (2 x 2) (4)

3.3. Name the dominant (main) type of erosion taking place in the river valley if rejuvenation took place in this river system. (1 x 2) (2)

3.4. The river valley shows evidence of rejuvenation.

(a) What does rejuvenation mean? (1 x 2) (2)

(b) Give TWO pieces of evidence from the FIGURE above to support the statement that rejuvenation has occurred. (2 x 2) (4)

(c) Give one reason that can cause river rejuvenation. (1 x 2) (2)

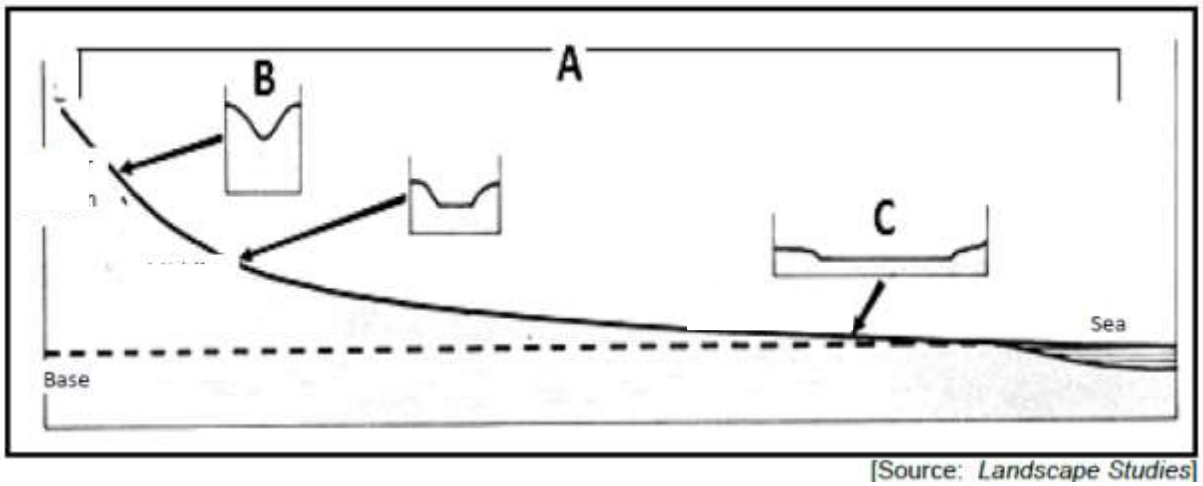
3.5. Explain how and why the dimensions of the river valley, illustrated in the figure above, will change once rejuvenation occurs. (2 x 2) (4)

© Gauteng Department of Education

QUESTION 4: 16 minutes [20] ***(Adapted from NSC March 2013 Paper 1)***

HINT: Stages of rivers must always be linked to cross and longitudinal profiles

FIGURE RIVER PROFILES



[Source: *Landscape Studies*]

4. Refer to the FIGURE above illustrating river profiles.

4.1. Identify the type of river profile labelled A and B respectively. (2 x 2) (4)

4.2. What evidence suggests that A is a graded profile? (1 x 2) (2)

4.3. What forms the permanent base level for the river? (1 x 2) (2)

4.4. Describe the difference between the shape of the valley at B and the shape of the valley at C. (2 x 2) (4)

4.5. Give reasons for the difference in the shape of the valley at B and the shape of the valley at C. (2 x 2) (2)

4.6. Identify the three stages of the river illustrated here and identify one landform that will develop in the stream channel in each stage. (6 x 1) (6)

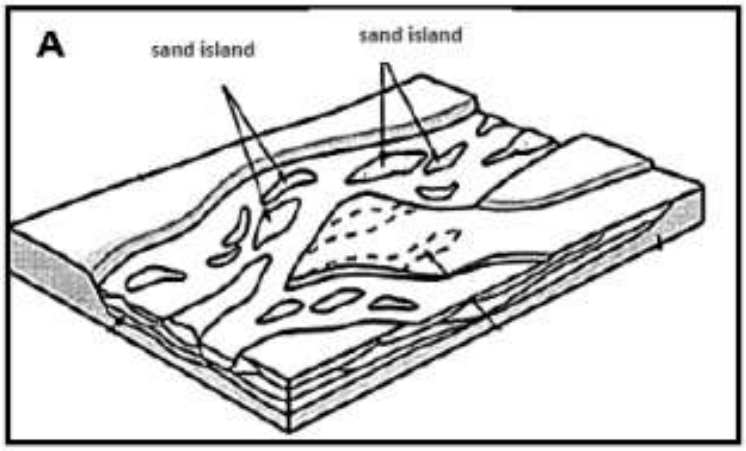
© Gauteng Department of Education

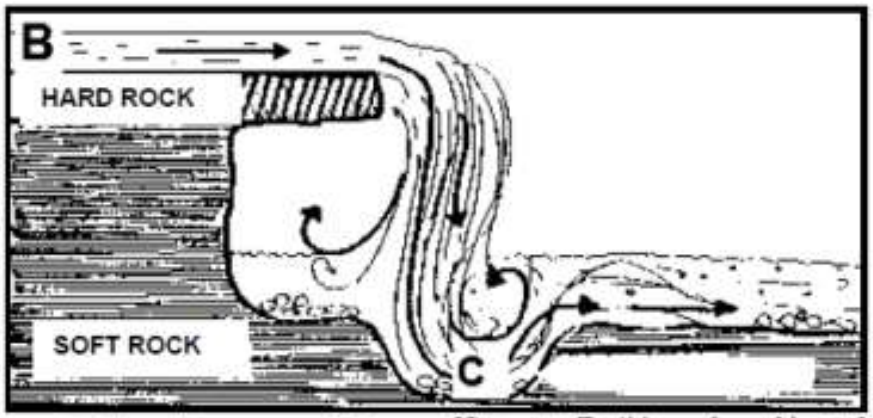
DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

QUESTION 5: 16 Minutes [20] ***(Adapted from NSC March 2013 Paper 1)***

FIGURE FLUVIAL LANDFORMS





[Source: *Earth's surface*: Money]

5. Refer to the fluvial features in the figures above. These features are found in different courses of the river.

5.1.	Identify the feature labelled B.	(1 x 2) (2)
5.2.	State ONE condition necessary for the formation of feature B.	(1 x 2) (2)
5.3.	What is the value of feature B for humankind?	(2 x 2) (4)
5.4.	Explain the development of feature A.	(2 x 2) (4)
5.5.	State in which course of the river features A and B are found.	(2 x 2) (4)
5.6.	Identify feature C and explain how it develops.	(2 x 2) (4)

QUESTION 6: 5 minutes [10] ***(Taken from NSC Nov 2013 Paper 1)***

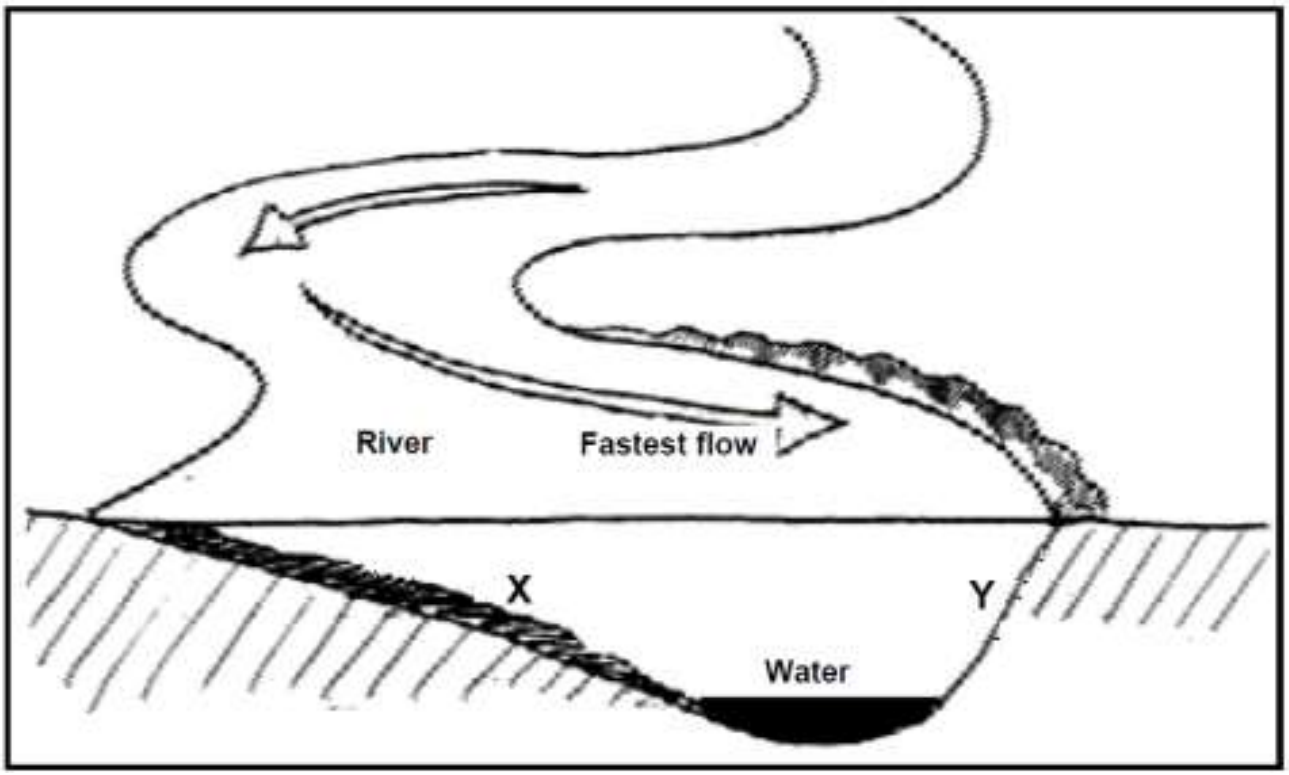
HINT: You must also be able to draw this sketch, label it and explain how It formed.

6. Refer to the FIGURE below which shows the profile of a river meander. Indicate whether the statements below apply to slope X or slope Y. Write only 'slope X' or 'slope Y' .

6.1.	The slope has a concave shape.	(1 x 2) (2)
6.2.	This slope has a gentle gradient.	(1 x 2) (2)
6.3.	The water flows faster against this slope.	(1 x 2) (2)
6.4.	Deposition takes place mainly on this slope.	(1 x 2) (2)
6.5.	This slope is known as the slip-off slope.	(1 x 2) (2)

© Gauteng Department of Education

FIGURE PROFILE OF A RIVER MEANDER



ÉcoleBooks

© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

SESSION NO: 7 GEOMORPHOLOGY
TOPIC 7: RIVER CAPTURE AND CATCHMENT AND RIVER MANAGEMENT

SECTION A: CONTENT NOTES ON RIVER CAPTURE AND CATCHMENT AND RIVER MANAGEMENT

TERMINOLOGY / DEFINITIONS

River capture / Stream piracy	When one river steals water from another river by cutting through the watershed into the drainage basin of the captive river
Headward erosion	When a river cuts back into the watershed by eroding its source and lengthening its stream
Abstraction	Watershed is being eroded backwards due to headward erosion along streams and sheet erosion on slopes
Superimposed streams	A river drainage pattern cut into an underlying landscape as it is eroded
Antecedent streams	A drainage pattern cut into a changing landscape as it develops. It does not fir the landscape
Drainage basins / Catchment areas	Area drained by a river system / area from where a river collects its water.
Lateral erosion	
Alluvium	
Elbow of capture	he sharp angle where stream capture took place.

EcoleBooks

STUDY TIPS

The river capture part is always asked with a sketch map of before and / or after sketches. You need to know the processes and the features very well. It is easy to obtain marks if you can label the sketch maps and describe each feature and describe how river capture takes place and how it will change the flow and erosion in both the captor and misfit streams. River management is often asked with a sketch of a changed drainage basin as well as a case study in the form of a newspaper article. These questions are easy as they require many of the answers are quite obvious. Just read the questions well and answer to the question.

© Gauteng Department of Education

5. CONCEPTS OF RIVER CAPTURE/STREAM PIRACY

5.1. Abstraction: This is the process where a watershed is cut back as the river system enlarges the drainage basin. This happens fastest along the streams as headward erosion lengthens the streams. The rest of the watershed is cut back slower by the process of sheet erosion.

5.2. River capture/stream piracy: takes place when one river cuts through a watershed and steels the headwater from another river.

5.3. Features associated with river capture

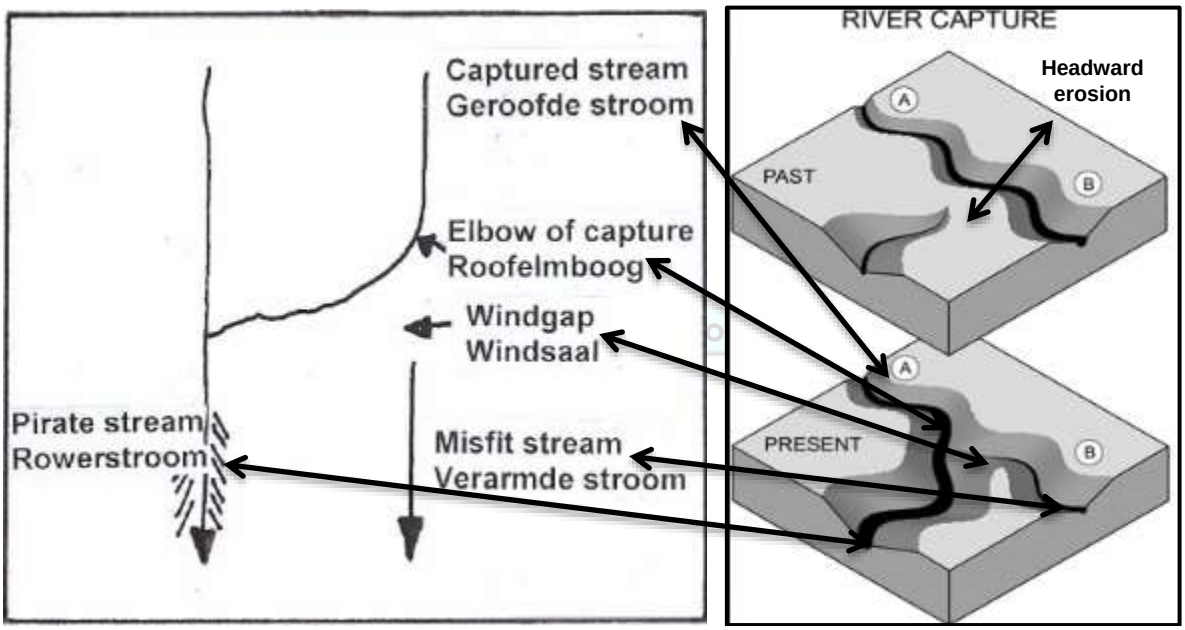
5.3.1. Captor stream / Pirate stream: the stream that has more erosive power and cuts through the watershed to capture the other stream.

5.3.2. Captured stream: the stream that loses its headwater to another stream.

5.3.3. Misfit stream: The stream that has lost its headwaters and in now too small for the valley that it flow in.

5.3.4. Elbow of capture: the sharp angle where stream capture took place.

5.3.5. Wind gap/River gravels: the area where the captured stream dries up and deposition take place just after the point of capture.



5.4. Impact of river capture on captor stream and captured stream

Captor Stream	Captured Stream
Larger drainage basin and catchment areas	Smaller drainage basin and catchment areas
Will have more water / larger volume	Will have less water / smaller volume
More erosive power / more energy	Less erosive power / less energy
Downward erosion	Deposition takes place
Rejuvenation due to renewed energy	Carrying capacity diminished
Carrying capacity will increase	Less stream load
Larger stream load	Misfit stream too small for valley
Knick point develop at point of capture	River gravel develop deposited in wind gap

© Gauteng Department of Education

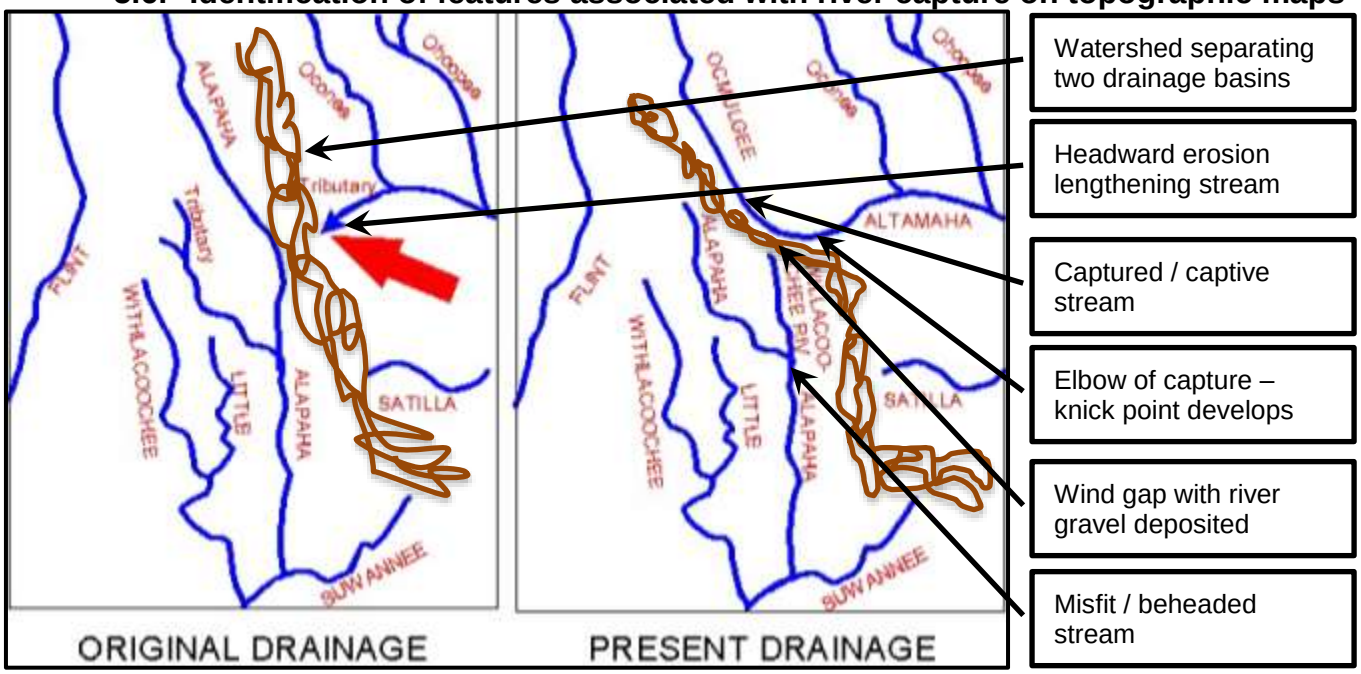
DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

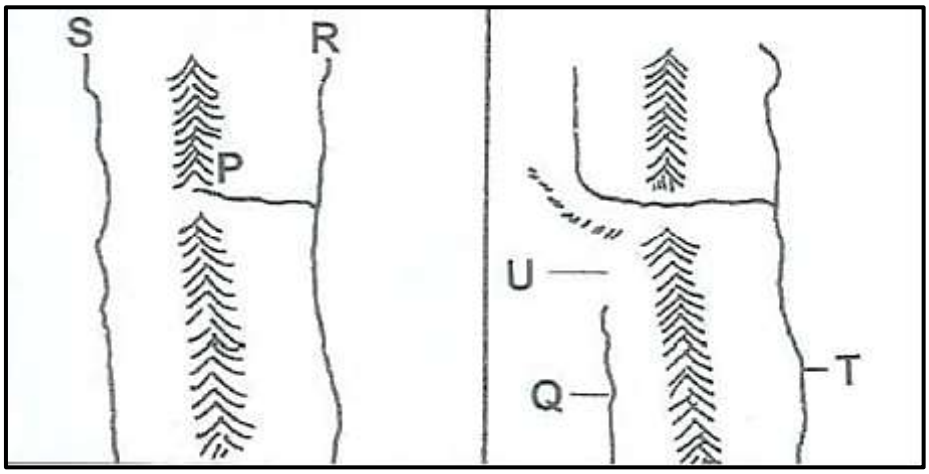
5.5. Implications of river capture for

	Captor / Pirate stream	Misfit / Beheaded Stream
Human activities	More activities due to more water – can support larger communities- migration to area	Less activities as less water cannot support many people – migration away from area
Settlements	Settlement will grow as more water can support larger settlement	Ghost towns will develop as people leave the area as they cannot make a living there
Recreation	Water recreation increases	Hiking / camping / less water related activities.
Agriculture	More water available for farming and food production	Area has less water – agriculture will deteriorate and change to adapt to drier conditions.
Flooding	Flooding of the valley as more water enters the system due to the enlarged drainage basin	Less water and thus less flooding

5.6. Identification of features associated with river capture on topographic maps

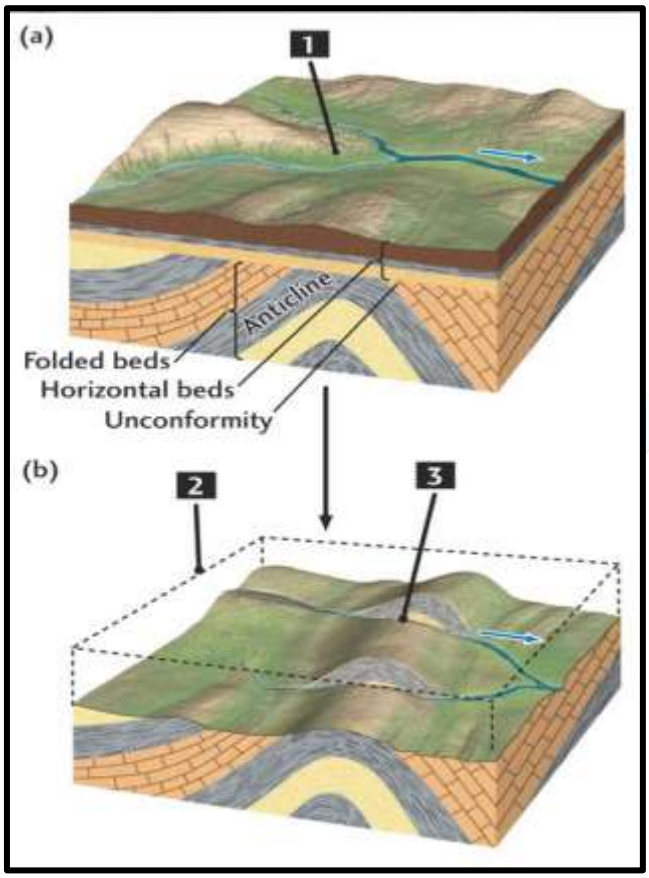


© Gauteng Department of Education



P: Headward erosion through watershed
Q: Misfit / beheaded stream
R: Captor / Pirate stream
S: Stream to be captured
T: Captor stream
U: Wind gap with river gravels

6. Superimposed and antecedent drainage patterns



2.1. Superimposed streams

- When a stream (1) uncovers a landscape (b) through erosion that is different to that of the overlying landscape (a) the river will cut the old drainage pattern into the newly uncovered landscape.
- The river cuts down into the landscape while it is uncovering it.
- The more resistant rock does not erode so fast on the floodplain
- A Dendritic drainage pattern (3) may then occur over a range of ridges (3) where a trellis pattern would have been appropriate.
- The landscape is older than the drainage pattern.
- E.g. the Apies river was super imposed onto the Magaliesberg homoclinal ridges
- The Vaal River was superimposed over the Vredefort dome

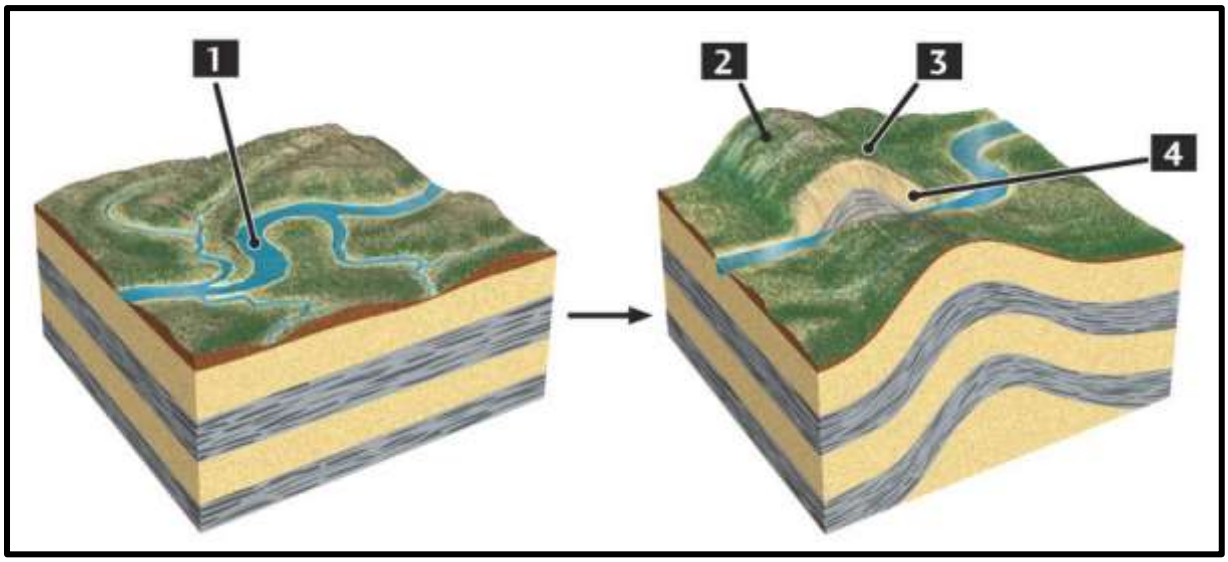
2.2. Antecedent streams

- The drainage pattern does not suite the geology (second sketch)
- The landscape changed slowly due to warping or folding.
- The river cut through the changing landscape as the change took place slowly.
- The landscape is younger than the drainage pattern.

© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM



http://sageography.myschoolstuff.co.za/geogwiki/grade-12-caps/geomorphology/fluvial-processes/superimposed-and-antecedent-drainage-patterns/

7. Catchment and River Management

7.1. Importance of managing drainage basins/catchment areas

Humans and nature is dependent on fresh water in catchment areas. Therefore the management of catchment areas are very important to ensure sustainable access to fresh water now and in the future. Flooding, droughts, pollution, use and recycling should be managed to ensure access to the water sources

7.2. Impact of people on drainage basins/catchment areas

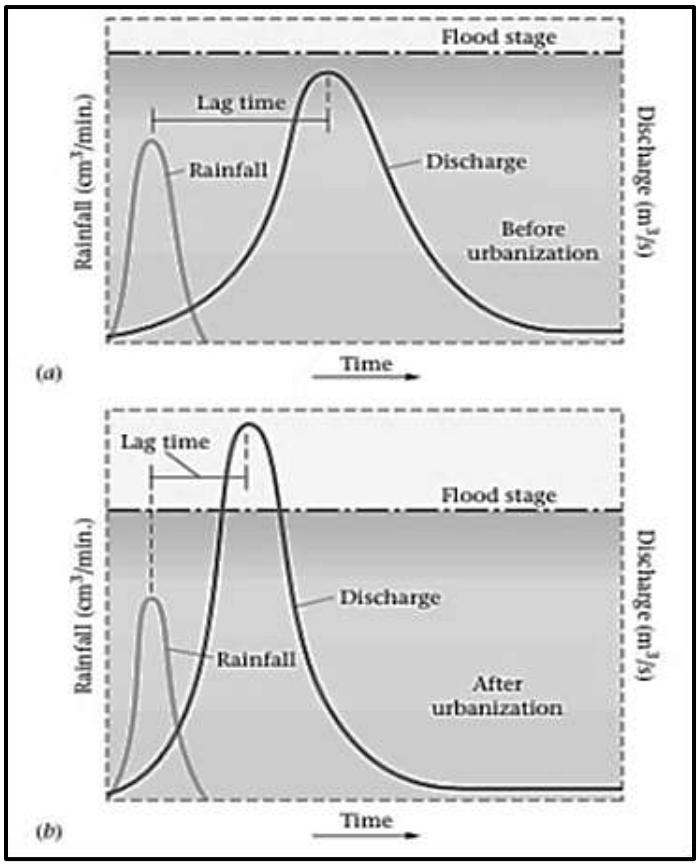
7.2.1. River pollution: deteriorate the quality of fresh water and destroys the aquatic ecosystems in rivers. River pollution is caused by sewerage, solid, waste, mining water, agricultural and industrial effluent that lands in water and change the ph. and chemicals in the rivers.

7.2.2. Overgrazing: caused by farmers keeping too many animals in an area lead to deterioration of vegetation. This leads to higher evaporation rates which lowers the water table and reduce run-off. Erosion is also more effective and this silts up the rivers and reduces the aquatic life in rivers.

7.2.3. Deforestation: takes place when humans clear areas for farming purposes (mostly mono-culture) and settlements. This encourage run-off and reduce infiltration which leads to more erosion and less sustainable water supply.

7.2.4. Human settlement: in settlements people replace the vegetation with buildings, concrete and tar. This reduces infiltration and increase run-off that leads to flooding and damage.

© Gauteng Department of Education



Flood hygrograms show the amount of rain fall compare to the run-off over a period of time These two diagrams illustrate the flooding before and after settlement in a drainage basin.

Graph 1

The flood peak is lower and the lag time longer when natural vegetation enhances infiltration and reduces run-off. They river does not flood the floodplain.

Graph 2

The many artificial surfaces in urban areas reduces infiltration, increases the run-off and reduce the lag time which can lead to flash flooding in urbanised drainage basins.

ÉcoleBooks

7.3. Strategies to manage drainage basins/catchment areas

- Although about 70% of the Earth's surface is covered by water, only 2% of the Earth's water is fresh water suitable for human use.
- This fresh water supply comes from rivers, dams and groundwater sources.
- Population growth, the expansion of agriculture and industry and increasing urbanisation mean more water is needed.
- People rely on rivers to provide water for many activities.
- Without water there can be no agriculture, no industry, no business and no development.
- People need the water from rivers for their homes.
- Rivers and dams provide people with hydro-electricity.
- Rivers supply us with food, and areas are used for recreational activities, tourism, cultural activities and settlement.
- Bird and wildlife depend on rivers and the RIPARIAN ZONE.
- Rivers and their catchment areas need to be monitored and managed so that everyone can have access to water, so that the ecosystems of the rivers remain healthy, so that flooding can be controlled and sustainable development can be maintained.
- Do not build within the 50 year flood line of a river.
- Do not take out the natural vegetation around rivers.

© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

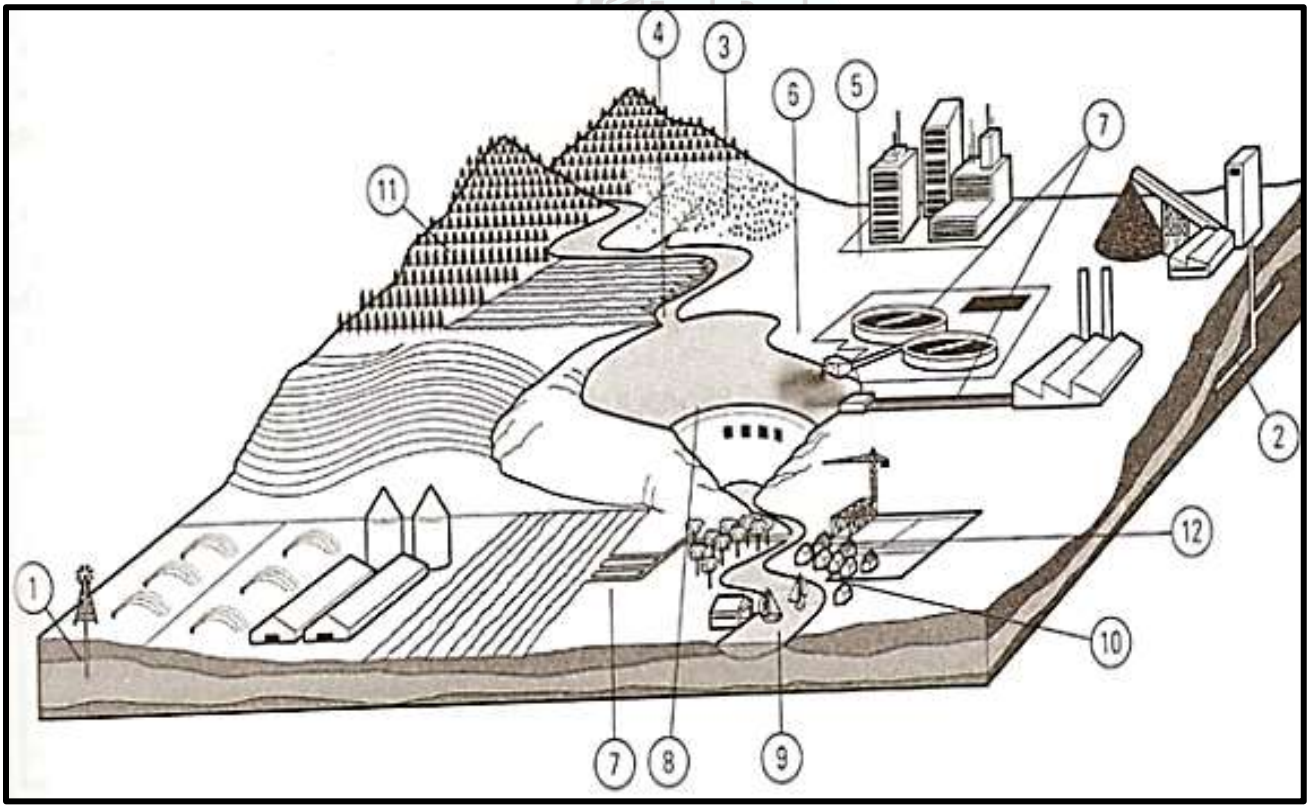
Download more resources like this on ECOLEBOOKS.COM

- Do not allow overgrazing.
- Build dams to regulate flooding, but ensure it can cope with flood capacity of rivers.
- Build bridges way above the normal level of the river.
- Conserve wetland and marshes as they absorb a lot of the flood waters.
- Build channels in urban areas that still allow infiltration.
- Build embankments on either side of the channel
- Cut through meander loops to prevent flooding.

Read the following with the sketch on the next page

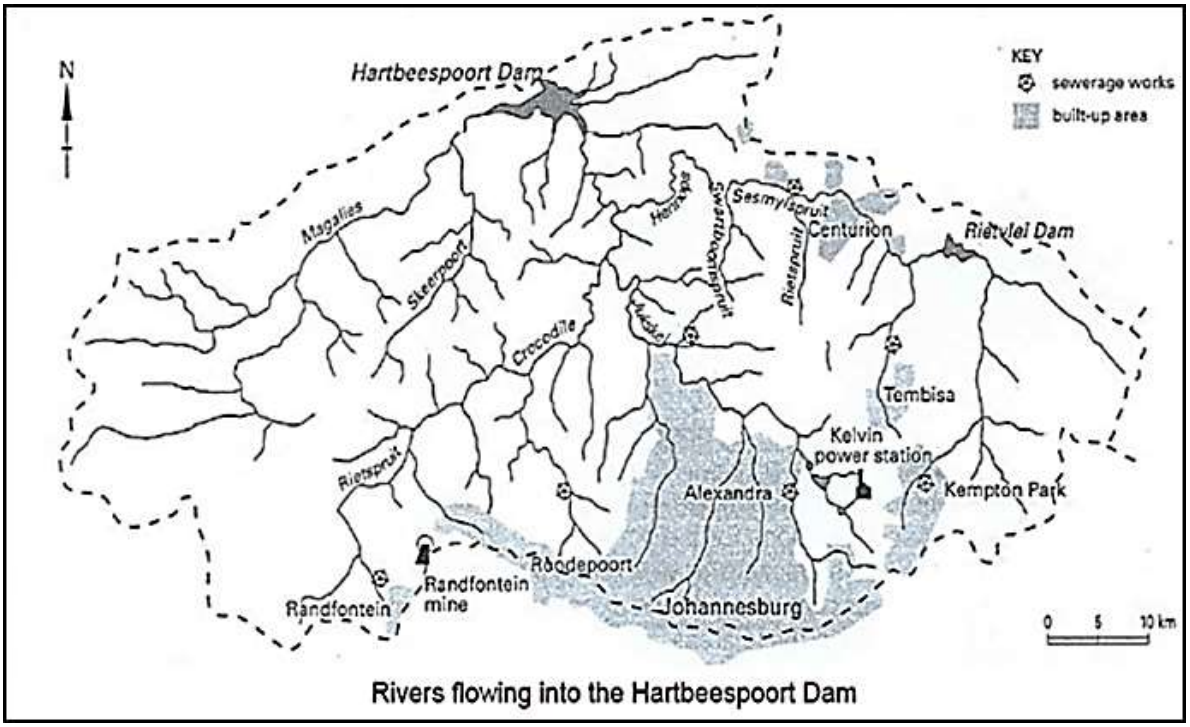
1. Boreholes extract water from groundwater
2. Mining pollute groundwater
3. Overgrazing and deforestation lead to less groundwater and silting of rivers.
4. Agricultural effluent lead to poisoning of aquatic ecosystem and algae growth
5. Artificial surfaces in cities cause faster runoff, shorter lag time and flooding.
6. Wetlands are polluted and used for agriculture – leads to flooding.
7. Use of water impacts on aquatic life - water returned to rivers is polluted.
8. Dams and water transfer schemes destroy ecosystems, displace people and lead to more erosion downstream. It changes the ecosystems of the areas.
9. Recreation near river cause littering and pollution and disturbs the ecology.
10. Settlement built to near to rivers cause banks to collapse and flooding
11. Alien plants and fish are introduced in rivers which reduce the biodiversity.
12. Flood control methods like building canals reduce normal flooding and fertility of the floodplain.

Extract from Focus on Geography – Summary of river management options.



© Gauteng Department of Education

7.4. Case study of one catchment management strategy in South Africa



Rivers flowing into the Hartbeespoort Dam

100 000 lives at risk

In the summer rainfall regions the lives of some 100 000 people are at risk. They are in danger because they live in flood-prone areas. One of these areas, with 6 000 residents, is an informal settlement below the banks of the Jukskei River within Alexandra Township, north of Johannesburg.

Residents have been warned many times about the dangers of building along the banks of the Jukskei, but they stay because there is nowhere else for them to go. Hundreds of shacks on the river banks have been washed away in the past yet residents remain undaunted and return to build.

This FIGURE shows the Jukskei River and other rivers that drain into the Hartbeespoort Dam.

The Jukskei River carries heavily polluted water into the dam. The sources of this pollution are from sewerage, domestic waste and detergents reaching the river from Alexandra Township, as well as effluent from mining areas and idustrial waste from the Kelvin power station and the industrial areas of Johannesburg. There are also many sewerage works along the rivers that flow into the dam.

Heavy rains in 1999, 2000 and 2001 have caused loss of life and homes along the Jukskei River in Alexandra. Building on a flood plain, so close to the river, is hazardous. As the Jukskei River rises north of Alexandra, rainwater does not infiltrate due to the impermeable artificial surfaces of the built-up area. Overland flow occurs and as a result there is a short lag time and high flood peak in the rivers as it flows through the township, which contributes to the heavy flooding experienced.

Living on the edge – Alexandra residents exist dangerously on the banks of the Jukskei River

© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

SECTION B: TYPICAL EXAM QUESTIONS ON RIVER CAPTURE AND CATCHMENT AND RIVER MANAGEMENT

FIGURE 1.1: IMPROVING WATER PRODUCTIVITY (NOVEMBER 2014)

STRATEGY FOR IMPROVING WATER PRODUCTIVITY

There has been a change in thinking concerning water resource management. Attention is being paid to activities that affect the upstream area of a river (catchment area) and the impact that this has on the lower reaches of the river. Some of the ways in which humans interfere with the river include building dams, water transfer, regulation, pollution, purification, et cetera. This changes the natural flow of the river.
All of the above have one common effect, and that is that they impact on those who live downstream.

The Upper Modder River is close to the relatively densely populated and industrialised greater Mangaung municipal area that includes Bloemfontein,
Botshabelo and Thaba Nchu. The area is known to be marginal for crop production due to low and erratic rainfall. This, combined with clay soils, results in high water losses caused by run-off and evaporation.

[Source: YE Woyessa, M Hensley and LD van Rensburg (Department of Soil, Crop and Climate Sciences, University of the Free State

ÉcoleBooks

Refer to FIGURE 1.1 and read the research article on improving water productivity.

1.1.1 Give the meaning of the term *water resource management*. (1 x 1) (1)

1.1.2 Name ONE settlement in the article that has a negative impact on the Upper Modder River. (1 x 1) (1)

1.1.3 State TWO ways in which humans are interfering with water (2 x 1) (2)

1.1.4 Name TWO factors that cause the high water run-off. (2 x 2) (4)

1.1.5 In a paragraph of approximately EIGHT lines, explain how human interference along a river impacts on those that live further downstream. (4X2) (8)

© Gauteng Department of Education

FIGURE 1.2 RIVER MANAGEMENT (EXEMPLAR 2014)

UMGENI RIVER 'ONE OF DIRTIEST' IN SA

7 June 2013
By Tony Carnie

Durban – The Umgeni River is one of the dirtiest rivers in the country, with recent studies showing proof of cholera, shigella, salmonella and other harmful viruses and bacteria at every sampling point between the Inanda Dam and Blue Lagoon in Durban.

The release of the study comes after the city's health unit has raised the alarm over a suspected outbreak of diarrhoea in Durban after two children died and more than
150 people were hospitalised in the past three months.

Though they do not pinpoint the exact pollution sources, the researchers suggest that the most likely sources of the viruses and bacteria in the Umgeni are inadequate municipal sewage treatment and run-off from informal houses close to the river.

'No wastewater treatment is provided and raw sewage enters the rivers and streams directly. Because of a lack of infrastructure in some settlements, the residents are often forced to inhabit river banks … People living in these areas often utilise the contaminated surface water for crop irrigation, recreation and domestic and personal use such as for washing, drinking water and cooking without prior treatment.'

The 230 km Umgeni River had been chosen for the study because it is the primary source of water for more than 3,5 million people in an area which generates almost 65 per cent of the provincial gross domestic product.

[Source: *Mercury*]

1.2 Read the case study on the Umgeni River in FIGURE 1.2.

1.2.1 Name the human activity that is polluting the Umgeni River. (1 x 1) (1)

1.2.2 What evidence suggests that the Umgeni River is dirty? (1 x 2) (2)

1.2.3 State the negative impact of the dirty water on the quality of life of people living in the area. (2 x 2) (4)

1.2.4 Suggest strategies that could be put in place to reduce the negative impact of humans on the Umgeni River. (4 x 2) (8)

© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

FIGURE 1.3 : POLLUTION ALONG THE UMGENI RIVER (JUNE 2015)

[Source: http:www.umgeniriver.walkfile.wordpress.com]

1.3 FIGURE 1.3 is a photograph showing pollution along a section of the Umgeni River.

1.3.1 What evidence suggests that pollution is occurring along this section of the river? (3 x 1) (3)

1.3.2 Discuss the impact of polluted water on the livelihood of people living along the banks of the Umgeni River. (2 x 2) (4)

1.3.3 Suggest strategies (in approximately EIGHT lines) that can be put in place to reduce pollution along the Umgeni River. (4 x 2) (8)

© Gauteng Department of Education

FIGURE 1.4: IMPACT OF HUMANS ON DRAINAGE BASINS (NOVEMBER 2015)

VAAL RIVER UNDER PRESSURE

Sipho Masondo | The Times Live

The Vaal River and its catchment system are becoming increasingly toxic/ poisoned – posing a threat to health, the economy and food production in four provinces.

Water scientists and other experts describe the Vaal River – which supplies water to Gauteng, the country's economic and industrial powerhouse, as well as to farmers in Gauteng, North West, the Free State and Northern Cape – as 'in crisis' and 'under siege' by polluters. Since the 1990s, the Department of Water Affairs has pumped water from the Lesotho Highlands into the river to supplement the water supply. This water is increasingly needed to dilute the pollution.

Said Krige 'We are using expensive drinking water to sort out the problem of pollution. Dilution is not a solution to pollution.'

The water in the Vaal River system will eventually cost far more to treat, leaving companies such as Sasol and Eskom to pay more for the chemicals needed to treat the water before they use it. This will increase their costs.

[Adapted from www.timeslive.co.za]

ÉcoleBooks

1.4 Read the newspaper article with the heading 'Vaal River Under Pressure' in FIGURE 1.4 and answer the questions that follow.

1.4.1 Name TWO provinces that are dependent on the Vaal River as a water source (2 x 1) (2)

1.4.2 Give TWO possible reasons why the Vaal River is becoming increasingly toxic/poisoned

. (2 x 1) (2)

1.4.3 According to the article, water is pumped into the Vaal River to dilute/reduce the pollution. Explain why this is not a sustainable solution (2 x 2) (4)

1.4.4 Explain, in a paragraph of approximately EIGHT lines, why the cost of food and electricity could increase in future if pollution of the Vaal River is not controlled

© Gauteng Department of Education

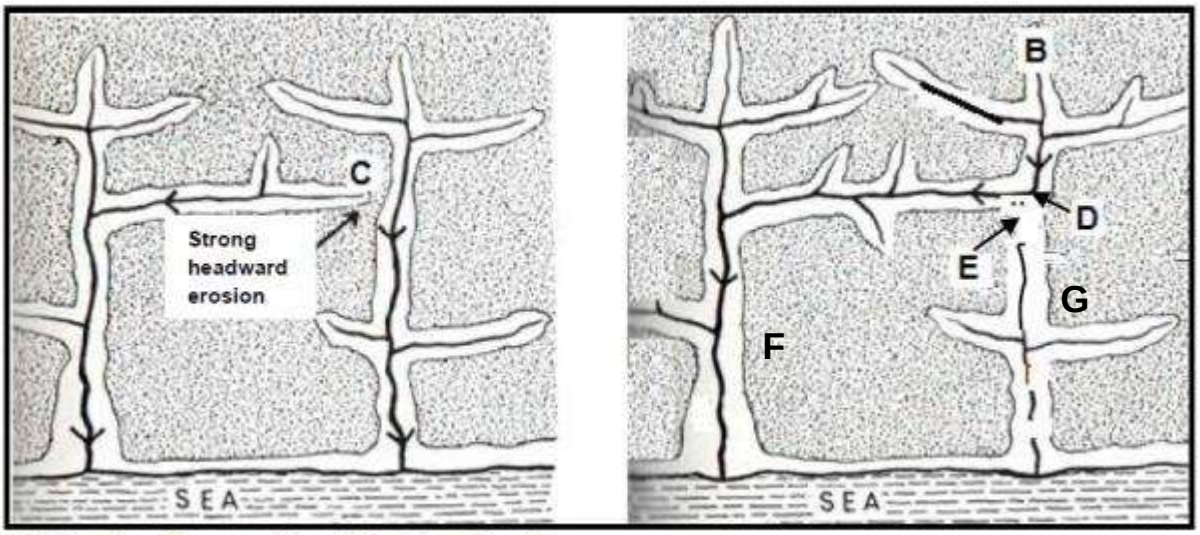
DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

SECTION C: HOMEWORK QUESTIONS ON RIVER CAPTURE AND CATCHMENT AND RIVER MANAGEMENT

QUESTION 1: 24 minutes [30] ***(Taken from NSC Nov 2012 Paper 1)***

FIGURE RIVER CAPTURE



[Adapted from *Earth's Surface*]

HINT: Know the feature of river capture well. Identify process from maps / sketches.

1. Refer to the FIGURE above illustrating river capture.

1.1. Define the terms river capture and abstraction (2 x 2) (4)

1.2. River C is involved in active headward erosion.

(a) Explain how headward erosion contributes to river capture. (2 x 2) (4)

(b) Give 2 possible reasons for headward erosion taking place. (2 x 2) (4)

1.3. Explain how river capture will influence the discharge of the rivers at B and F respectively? (2 x 2) (4)

1.4. Name the features labelled D, E and G that result from river capture. (3 x 2) (6)

1.5. River capture brings about changes in both captor and captured streams. Explain (approximately 12 lines) some of the physical changes that will occur in captor and captured rivers respectively. (4 x 2) (8)

© Gauteng Department of Education

QUESTION 2: 24 minutes [30] ***(Taken from NSC March 2013 Paper 1)***

HINT: the factors influencing infiltration, runoff and erosion is very important

2. Study the figure below before answering the following questions.

2.1. Define the term drainage basin. (1 x 2) (2)

2.2. Name ONE source of water for a drainage basin. (1 x 2) (2)

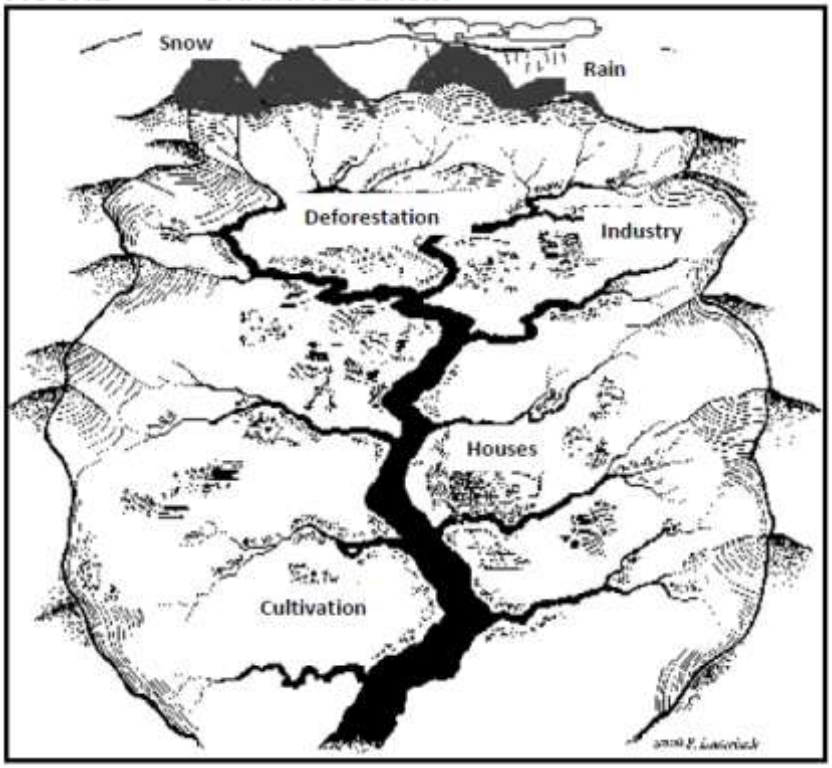
2.3. Some drainage patterns have a high density. How does climate influence the stream density of rivers that flow along the east coast of South Africa? (2 x 2) (4)

2.4. Give THREE reasons why drainage basins are useful to people. (3 x 2) (6)

2.5. Identify four human activities form the figure below and describe the negative impact it have on drainage basins. (4 x 2) (8)

2.6. Many human activities are destroying our drainage basins. Write a paragraph (approximately 12 lines) giving suggestions on how we can take better care of our drainage basins. (4 x 2) (8)

FIGURE DRAINAGE BASIN



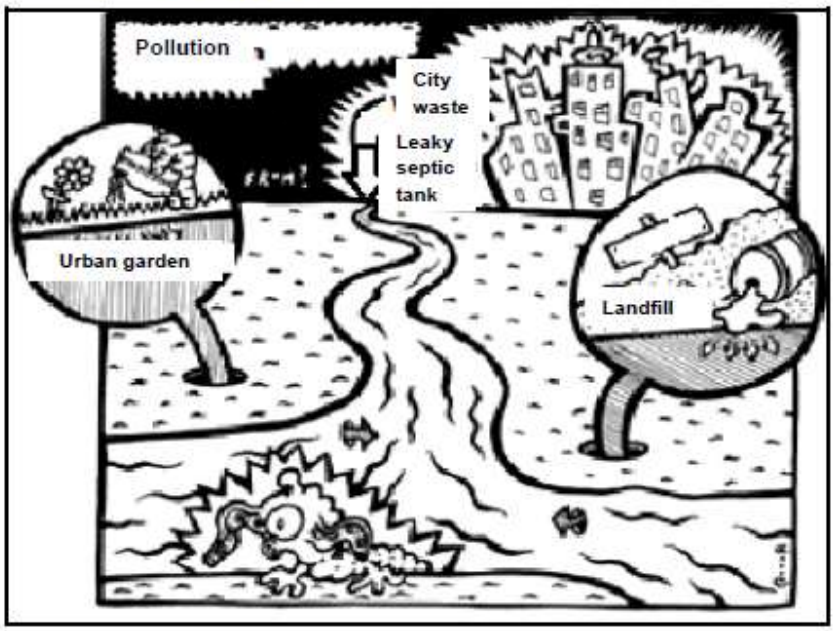
© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

QUESTION 3: 16 minutes [20] ***(Taken from NSC Nov 2012 Paper 1)***

FIGURE . RIVER POLLUTION



You must be able to interpret cartoons. The human impact on nature is often referred to cartoons. Make sure you can identify the Geographical issue depicted.

3. Refer to the figure above which is a cartoon showing river pollution.

3.1. Name TWO ways in which an urban area contributes to the pollution of rivers. (2 x 2) (4)

3.2. Suggest TWO measures that can be put in place to reduce water pollution from urban areas. (2 x 2) (4)

3.3. List two reasons why rivers are important for city dwellers. (2 x 2) (4)

3.4. Write a paragraph (approximately 12 lines) assessing the negative impact that human activities have on rivers. (4 x 2) (8)

QUESTION 4: 42 minutes [35] ***(Adapted from DoE Exemplar 2008 Paper 1)***

HINT: some of the answers should be read form the addendum directly e.g., c, b.

4. Study the map of the Hartebeespoort Dam area and newspaper article before answering the following questions:

4.1. a) Identify the main stream in this river system form the map above. (1 x 1) (1)

b) Which tributary runs through Centurion? (1 x 1) (1)

c) In which direction does this river system flow? (1 x 1) (1)

© Gauteng Department of Education

d) This river system is a super imposed river system where it passes through the Magaliesberg. Explain and describe what t a superimposed river system is. (3 x 2) (6)

e) Identify the drainage pattern of the Jukskei River as seen in the figure above in the case study. (1 x 2) (2)

f) Give One characteristic evident from the map to substantiate your answer to QUESTION 1.1.a) (1 x 2) (2)

4.2 (a) Flooding is common in Alexandra. What is a flood? (1 x 2) (2)

(b) Why do people still build shacks on the banks of the Jukskei River if the area is threatened by constant flooding? (1 x 2) (2)

(c) Explain why there is a short lag time and a high flood peak as the Jukskei River flows through Alexandra. (3 x 2) (6)

(d) Name any TWO consequences of flooding for the inhabitants of Alexandra. (2 x 2) (2)

4.3 (a) Describe the locations of the sewerage works in relation to the rivers shown in the figure above (1 x 2) (2)

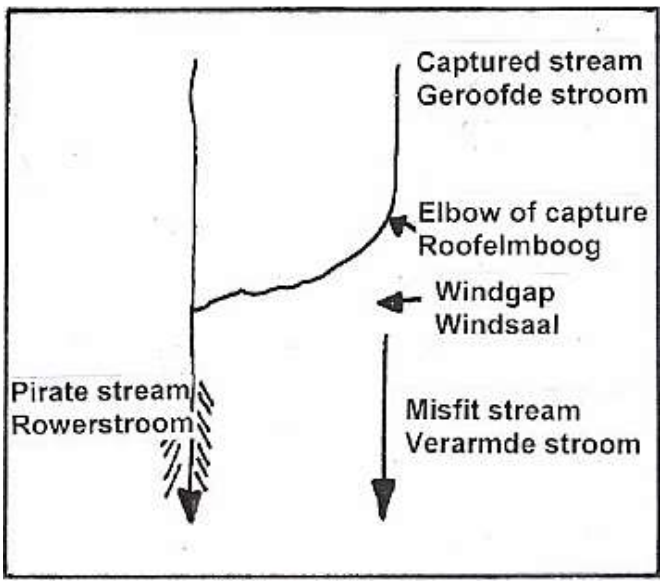
(b) What are the consequences of the above for people living on the banks of the Hartbeespoort Dam? (2 x 2) (4)

(c) State TWO measures that can be introduced by the provincial government to ensure that all rivers flowing into the Hartbeespoort Dam is free of sewerage effluents. (2 x 2) (4)

ÉcoleBooks

QUESTION 5: 20 minutes 25 marks *(Source: DoE November 2009)*

Refer to the figure below showing different features of river capture. Give ONE word/term for each of the following descriptions. Write only the word/term next to the question number as an answer.



© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

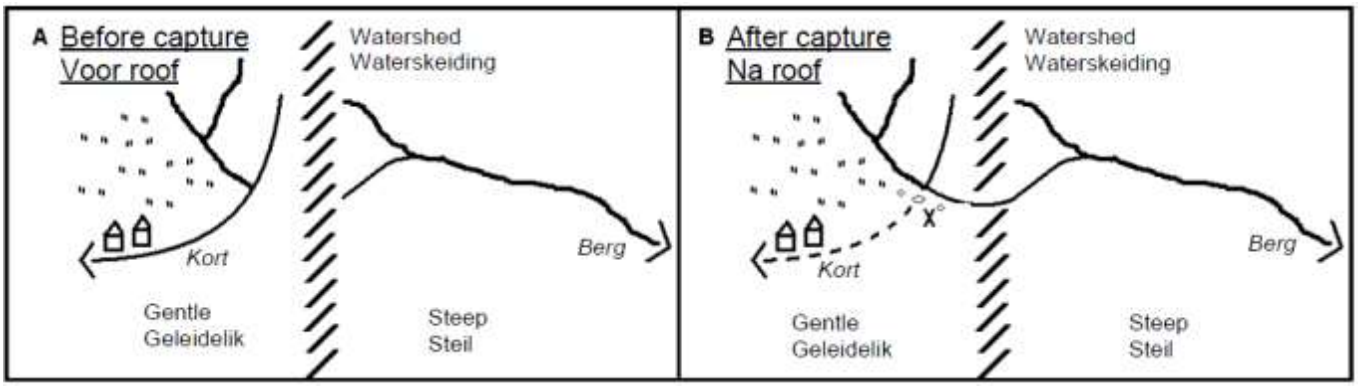
Download more resources like this on ECOLEBOOKS.COM

5.1.1 A stream whose headwaters have been intercepted.
5.1.2 A stream that is smaller than the valley through which it flows.
5.1.3 The point where an energetic stream intercepts the water of another stream.
5.1.4 A dry valley where no stream flows.
5.1.5 A stream that intercepts the water of another stream. (5 x 1) (5)
5.2. Identify two processes that took place in this area. (2 x 2) (4)
5.3. Explained what caused the process and how this process took place. (4 x 2) (8)
5.4. Write a paragraph to explain how erosion and discharge will be influenced along the Misfit and Pirate streams respectively. (4 x 2) (8)

QUESTION 6: 16 minutes 20 marks *(Source: DoE November 2010)*

HINT: River capture can be asked with many sketch maps – practice on many.

6. The FIGURE below illustrates the concept of river capture/stream piracy.



6.1 Name ONE factor which could have resulted in the Berg River eroding through the watershed to capture the Kort River. (1 x 2) (2)
6.2. Name TWO features of river capture that could develop at point X. (2 x 2) (4)
6.3 Why is the beheaded stream (Kort River) in sketch B referred to as a misfit stream? (1 x 2) (2)
6.4 Name TWO effects that river capture has on the captor stream (Berg River) in sketch B. (2 x 2) (4)
6.5 Write a paragraph (no more than 12 lines) presenting a detailed report on how river capture influences human activities along the Kort and the Berg Rivers respectively. (8 x 2) (8)

© Gauteng Department of Education

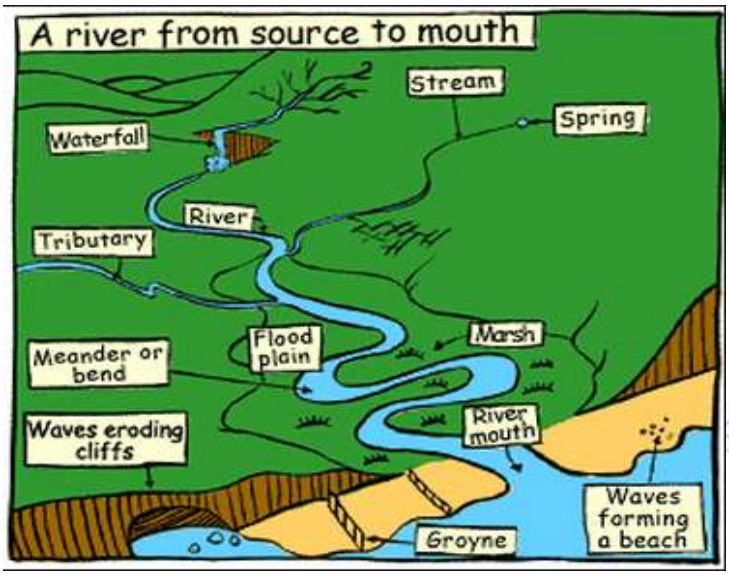
SESSION NO 9: GEOMORPHOLOGY CONSOLIDATION
TOPIC 9: DRAINAGE BASINS AND FLUVIAL PROCESSES IN SOUTH AFRICA

SECTION A: SUMMARY CONTENT NOTES ON GEOMORPHOLOGY

Terminology / Definitions were dealt with in the previous sessions on Geomorphology.

Study tips: Remember that you need to know the terminology, processes and sketches very well.
Important concepts and explanations were explained in the previous Geomorphology sessions. In this session only a visual summary is given of the concepts. Try to use this to remember all the work and explain it by referring to the sketches.

1. Drainage basins in South Africa



Source / origin: where the river starts
Confluence: where 2 streams meet
Drainage basin: area drained by river
Meanders: bends in rivers
Watershed: high lying area separating two different drainage basins
Water table: top level if underground water
Base flow: groundwater seeping into rivers
Direct runoff: water that drains over land to rivers.
River mouth: where river ends in the sea
Waterfall: vertical drop in stream channel.

1.1. Types of Rivers

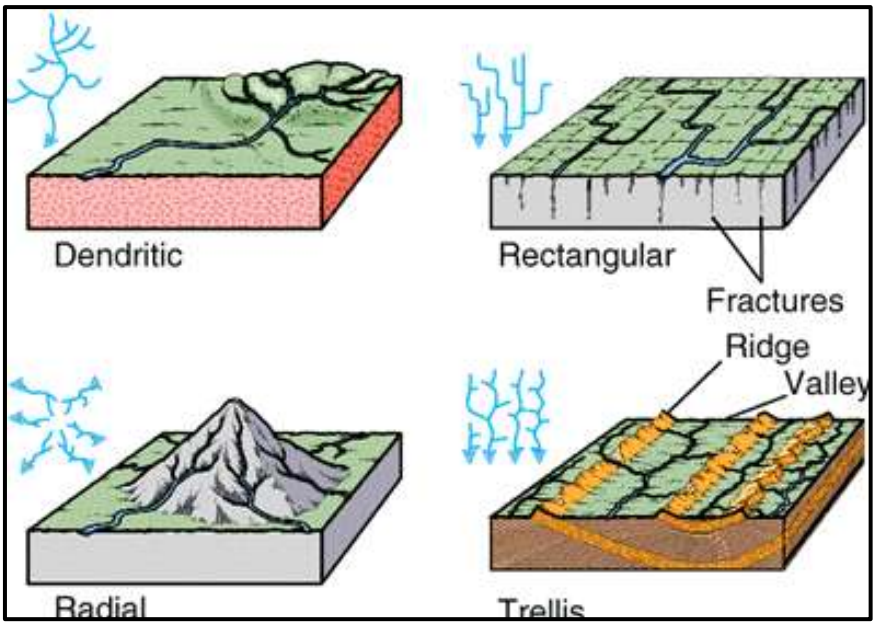
Permanent: always has water from direct run-off and base flow
Periodic: Runs only in the rainy season every year. Get base flow and direct run-off in the rainy season, but water table below stream channel in dry season
Episodic: never get base flow – only runs occasionally when it rains in dry areas.
Exotic: runs through a dry region but are fed form the upper reaches where there is more rainfall.

© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

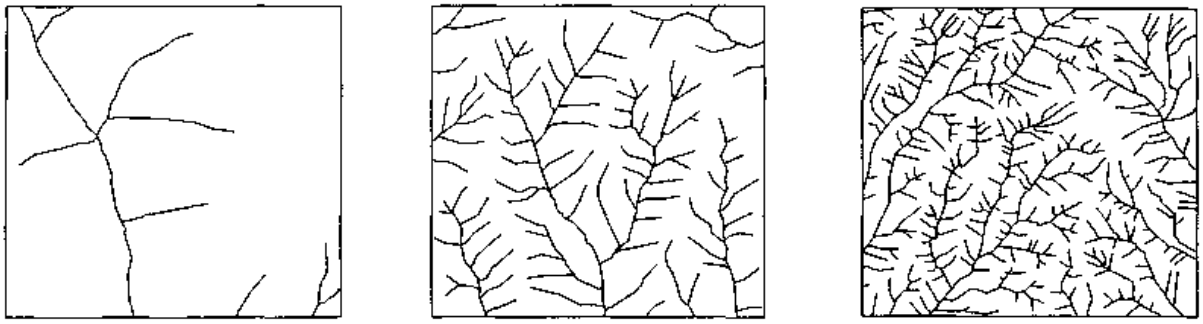
1.2. Drainage patterns



Dendritic: tree shaped, flow on uniform igneous or sedimentary rock
Rectangular: forms right angles in main stream and tributaries as streams follow joints in rock
Radial: stream flow from central point outward form central high lying area
Trellis: Parallel main stream and short tributaries joining main stream at right angles draining parallel ridges and valleys.

http://alpha.sd41.bc.ca/depts/socials/Geog/ae.htm

1.3. Drainage density

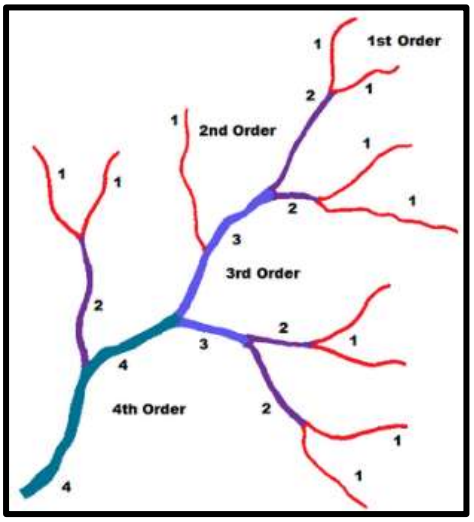


a) low b) medium c) high

The total length of stream / area. Determined by factors influencing run-off and infiltration. (Gradient, porosity, permeability, vegetation, type, amount and season of rainfall)

1.4. Stream order

All streams are order 1
Where order 1 and 1 meets it becomes 2
Where 2 and 2 meets it becomes 3
Where order 3 and 3 meets it becomes 4
Many short order 1 streams on steep gradient
Fewer high order streams that are longer and running on a gradual gradient
Higher order stream has a larger volume than low order stream

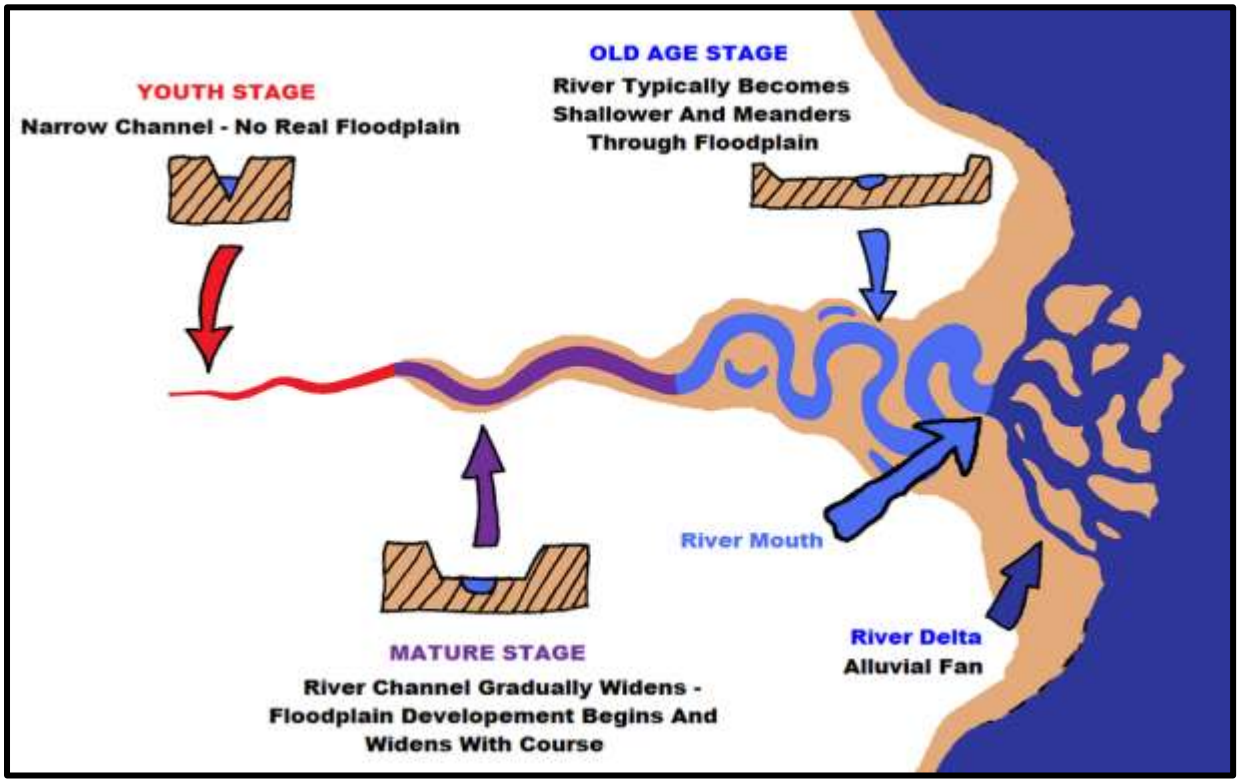


http://www.profantasy.com/rpgmaps/?p=2017

© Gauteng Department of Education

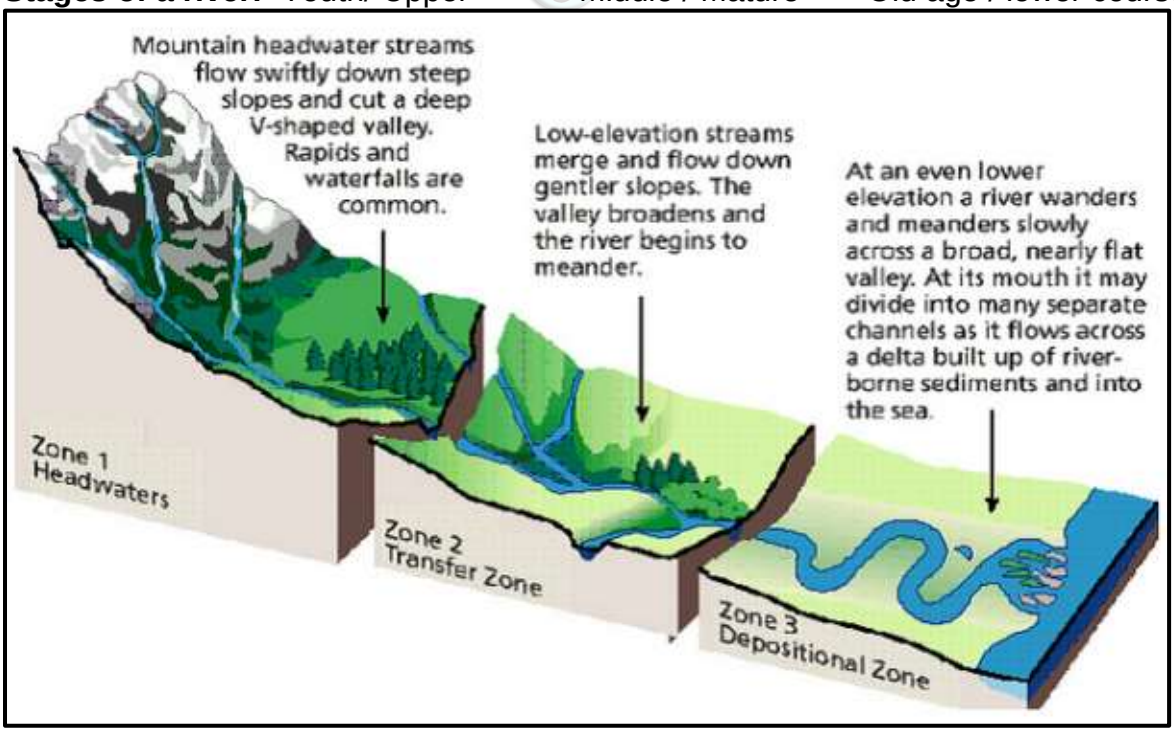
2 Fluvial processes

2.2 **River Profiles** (Cross profile – through valley. Longitudinal profile form source to mouth)



http://www.profantasy.com/rpgmaps/?p=2017

Stages of a river: Youth/ Upper Middle / Mature Old age / lower course



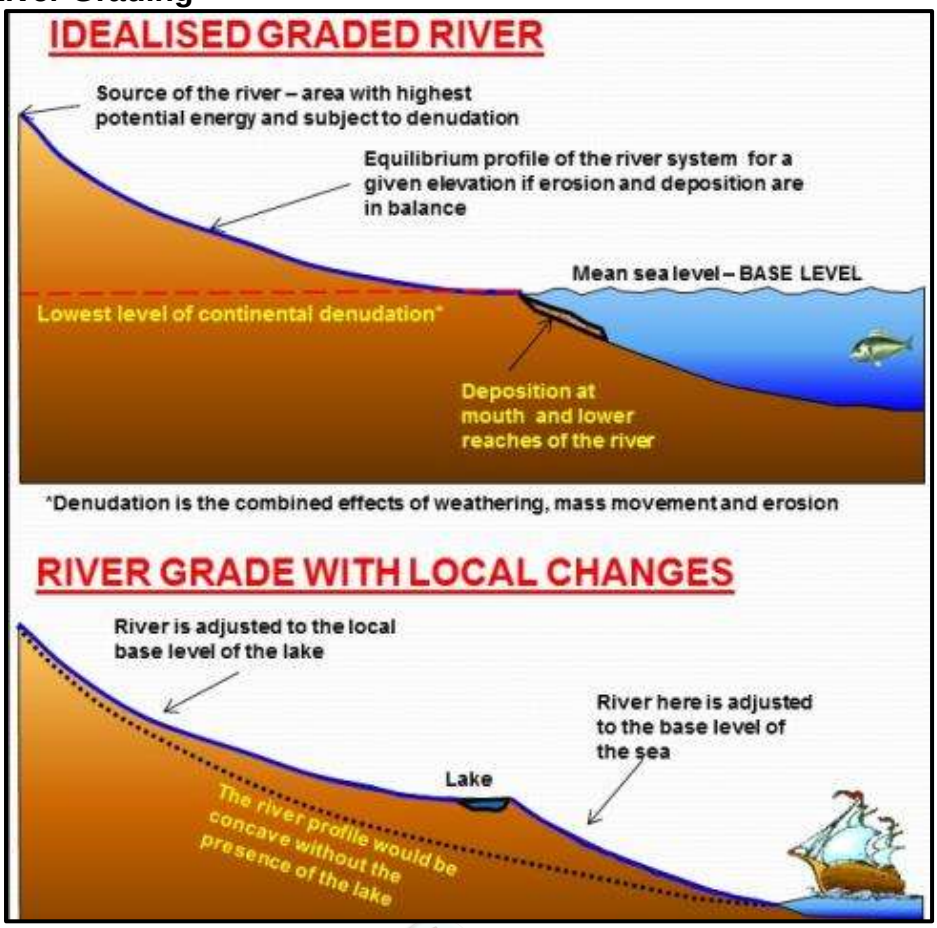
http://riverrestoration.wikispaces.com/Fluvial+geomorphology+2

© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

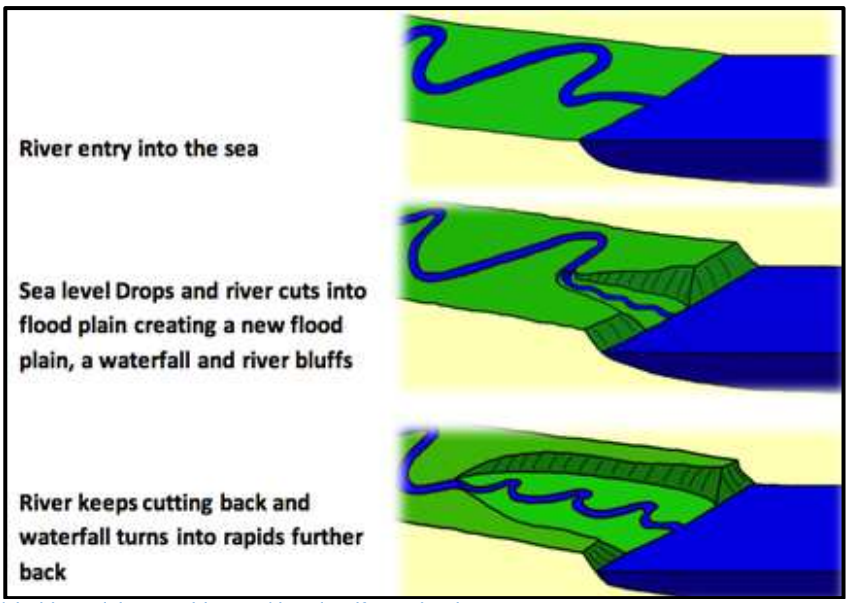
Download more resources like this on ECOLEBOOKS.COM

2.3 River Grading



ÉcoleBooks

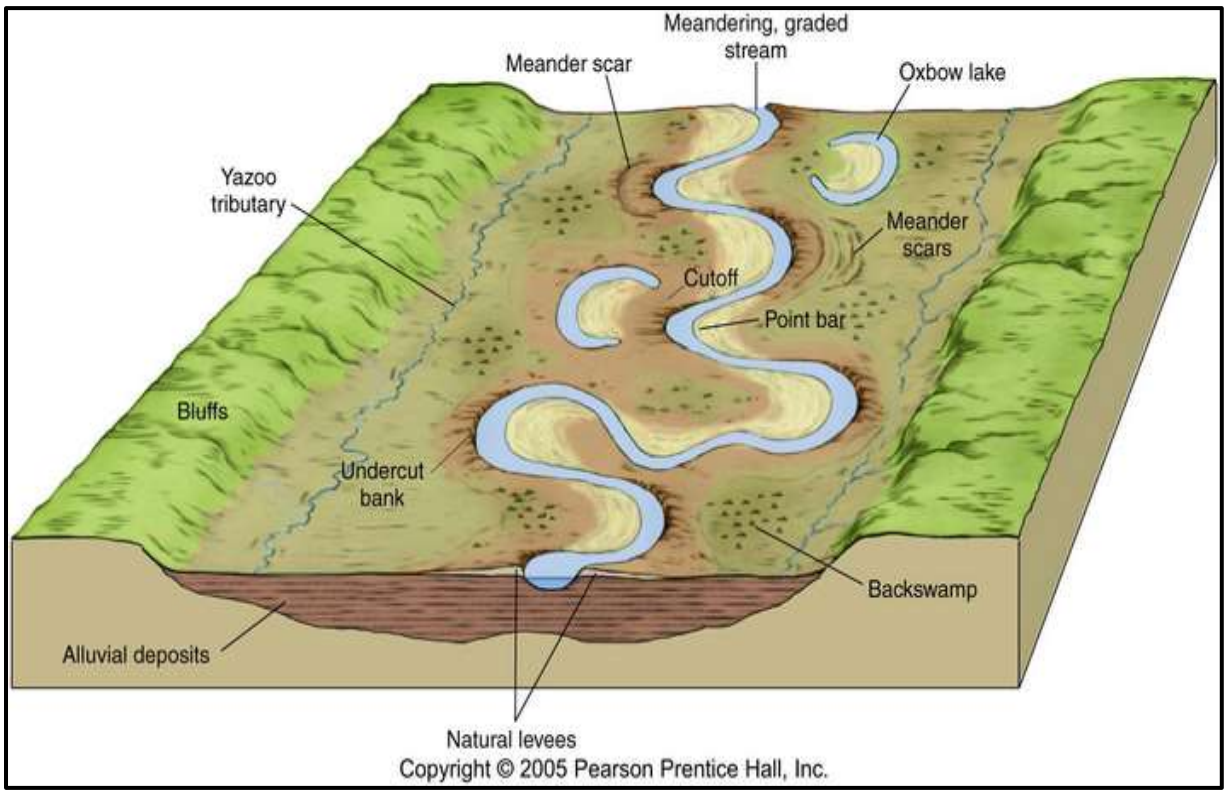
2.4 River Rejuvenation: River gains energy through more rainfall or lifted land mass and erodes / cuts downward again. Old age stage take on characteristics of the Youth stage e.g. waterfalls, rapids, deep valleys etc.



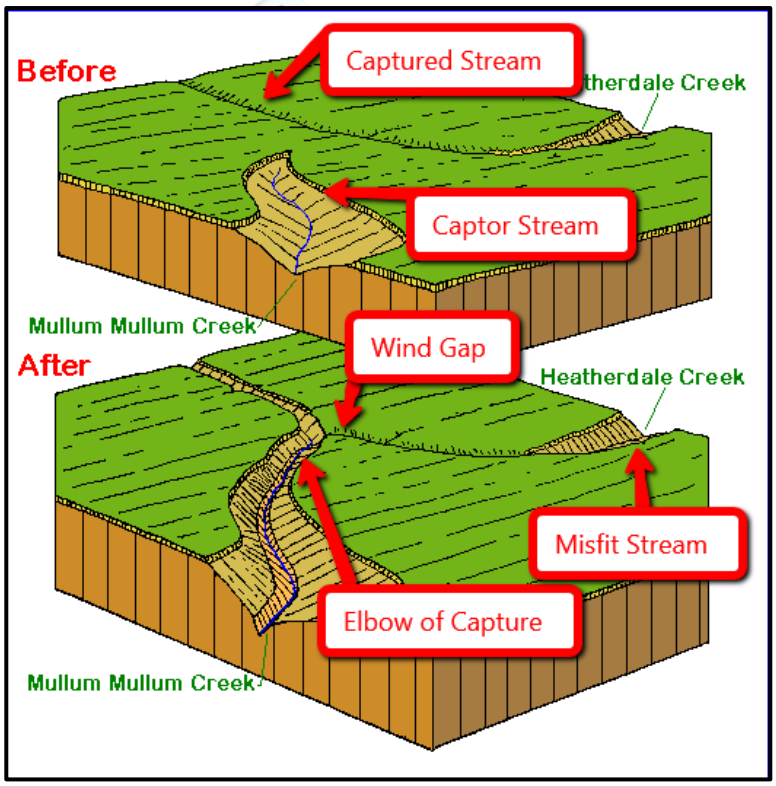
http://chubbyrevision.weebly.com/river-landforms.html

© Gauteng Department of Education

2.5 Fluvial Landforms



2.6 River Capture: one stream steal water from another river



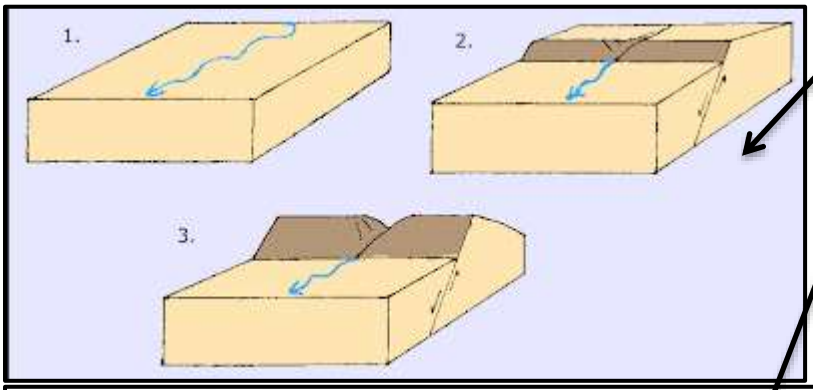
http://sageography.myschoolstuff.co.za/geogwiki/grade-12-caps/geomorphology/fluvial-processes/river-capture/

© Gauteng Department of Education

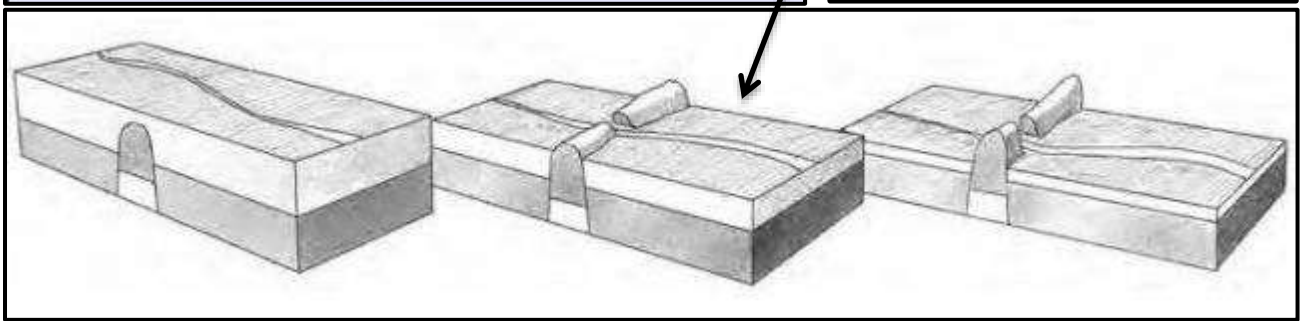
DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

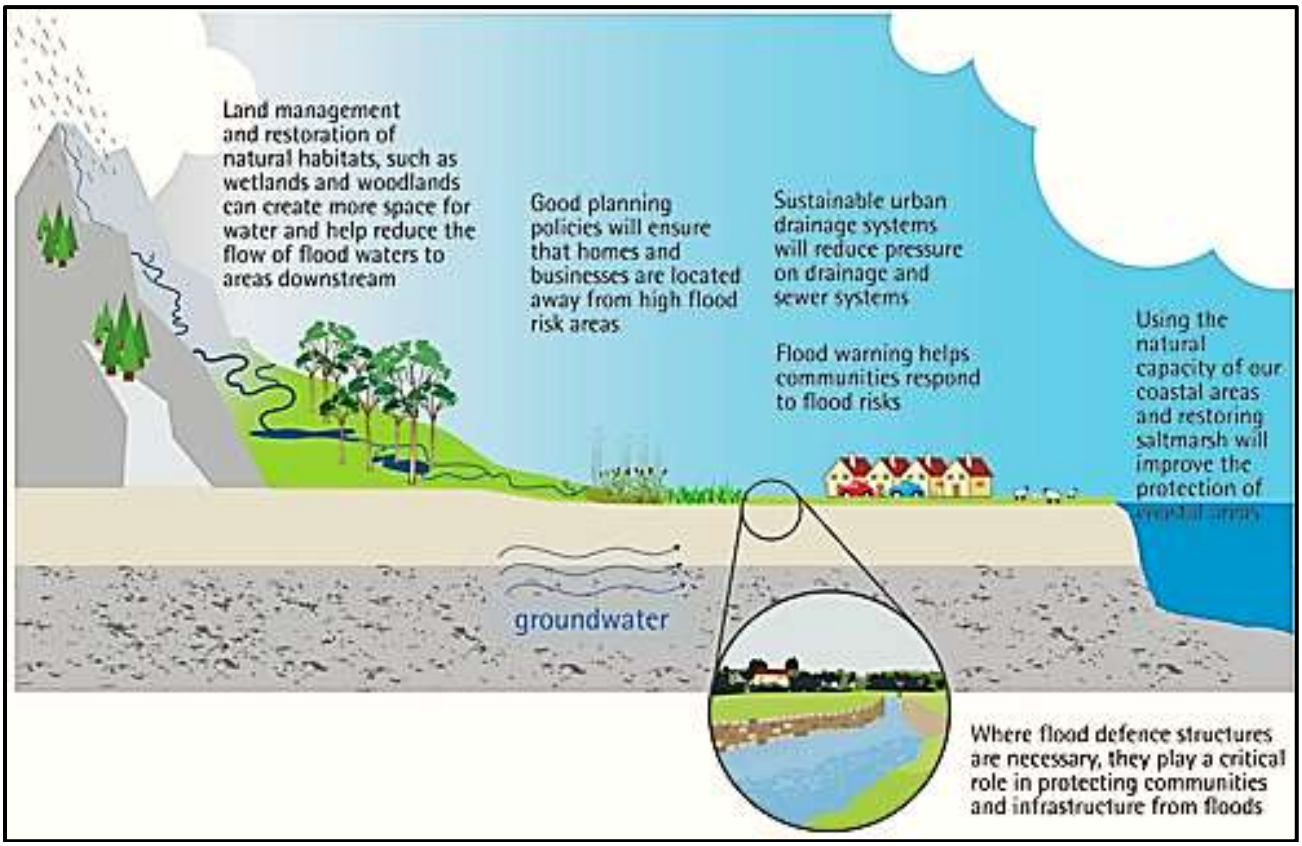
2.7 Super imposed and Antecedent Stream patterns



Antecedent Streams cut into a slowly changing landscape – faulting on the left took place but as it took place the river cut through the lifting landscape.
Superimposed streams cut through a different landscape under the previous one as erosion opens up the area. See Bottom



3 River management

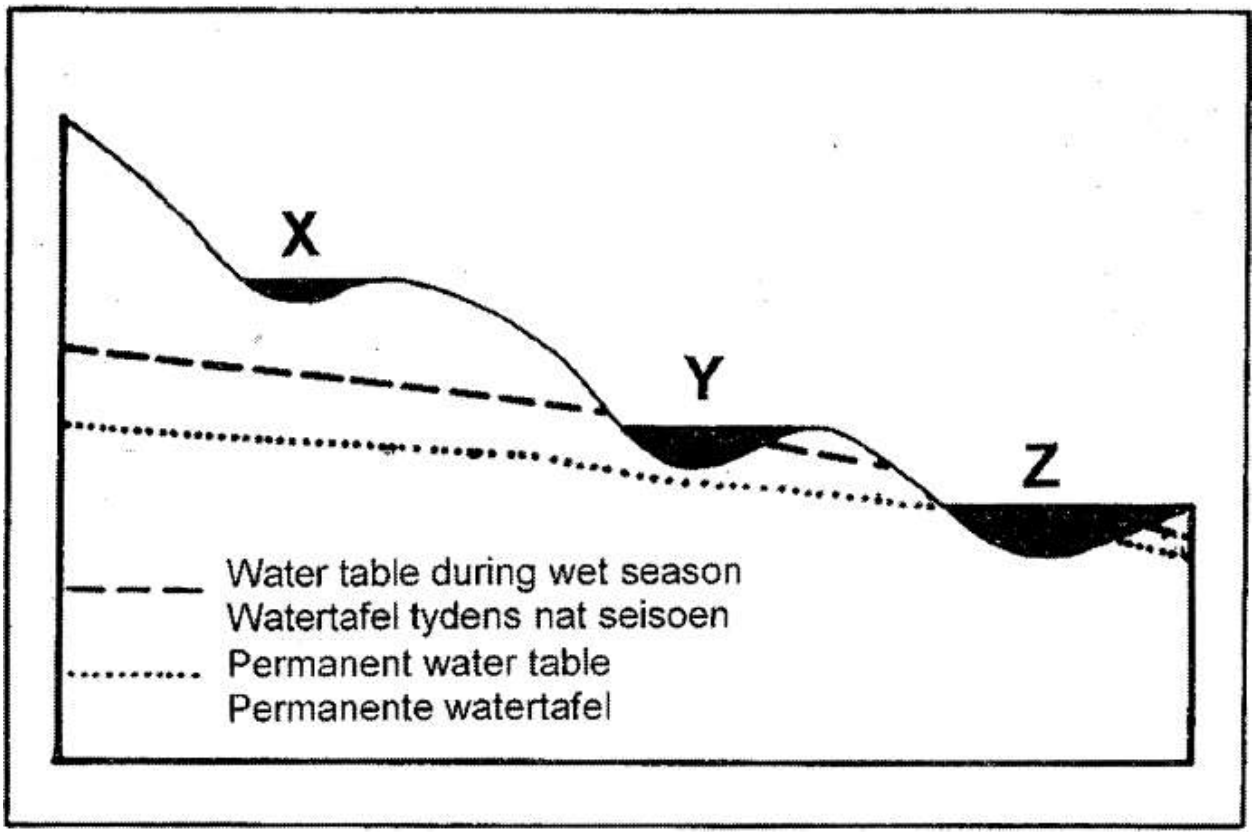


© Gauteng Department of Education

SECTION B: PRACTICE QUESTIONS

HINT: Geomorphology is easy if you know your sketches and definitions. You need to study it well to be able to get marks but it is not that difficult.

QUESTION 1: 21 minutes 26 marks *(Adapted from March 2010)*



1. Refer to the figure above illustrating the relationship between stream type and the water table.

1.1 Identify the types of rivers X, Y and Z. (3 x 2) (6)
1.2 Explain where and when rivers X, Y and Z gets its water from. (3 x 2) (6)
1.3 Explain what the water table is. (1 x 2) (2)
1.4. Explain why the water table changes. (2 x 2) (4)
1.5. In what type of climatic regions will river X, Y and Z be found respectively? (3 x 2) (6)
1.6. Why would X and Y not be suitable as transport routes? (1 x 2) (2)

© Gauteng Department of Education

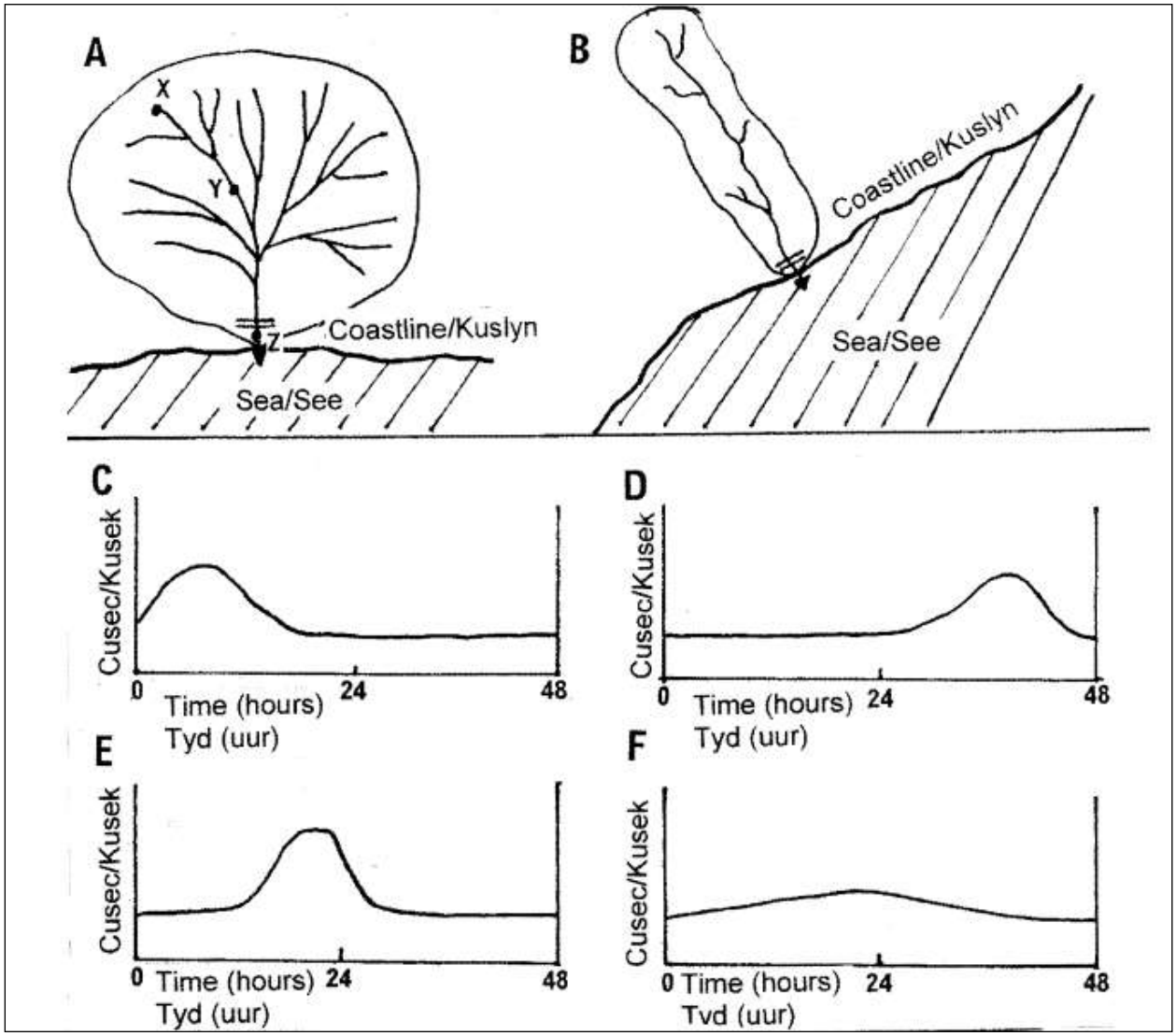
DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

QUESTION 2: **16 minutes** **20 marks** *(Adapted from March 2010)*

HINT: Drainage basins and runoff is asked together – read some info from graphs.

Refer to FIGURE 2.4 (A – F) representing the drainage basins of two river systems (A and B) and flow hydrographs (C – F) to show run-off in rivers after rain showers. Also read the extract on floods below.



Flooding occurs when water overflows its normal channels such as streams and storm water drains. Floods may also occur when there is an accumulation of water by drainage into areas which are not normally submerged. Floods are common in South Africa following long periods of drought. Drought, overgrazing and the deterioration of the land make the ecosystem vulnerable. Humans can alter the flow characteristics of a river negatively by clearing vegetation, constructing impermeable tar and concrete surfaces, and building on a river's flood plain.

© Gauteng Department of Education

2.1. Define the following terms referred to above:

(a) Drainage basin (1 x 2) (2)

(b) River system (1 x 2) (2)

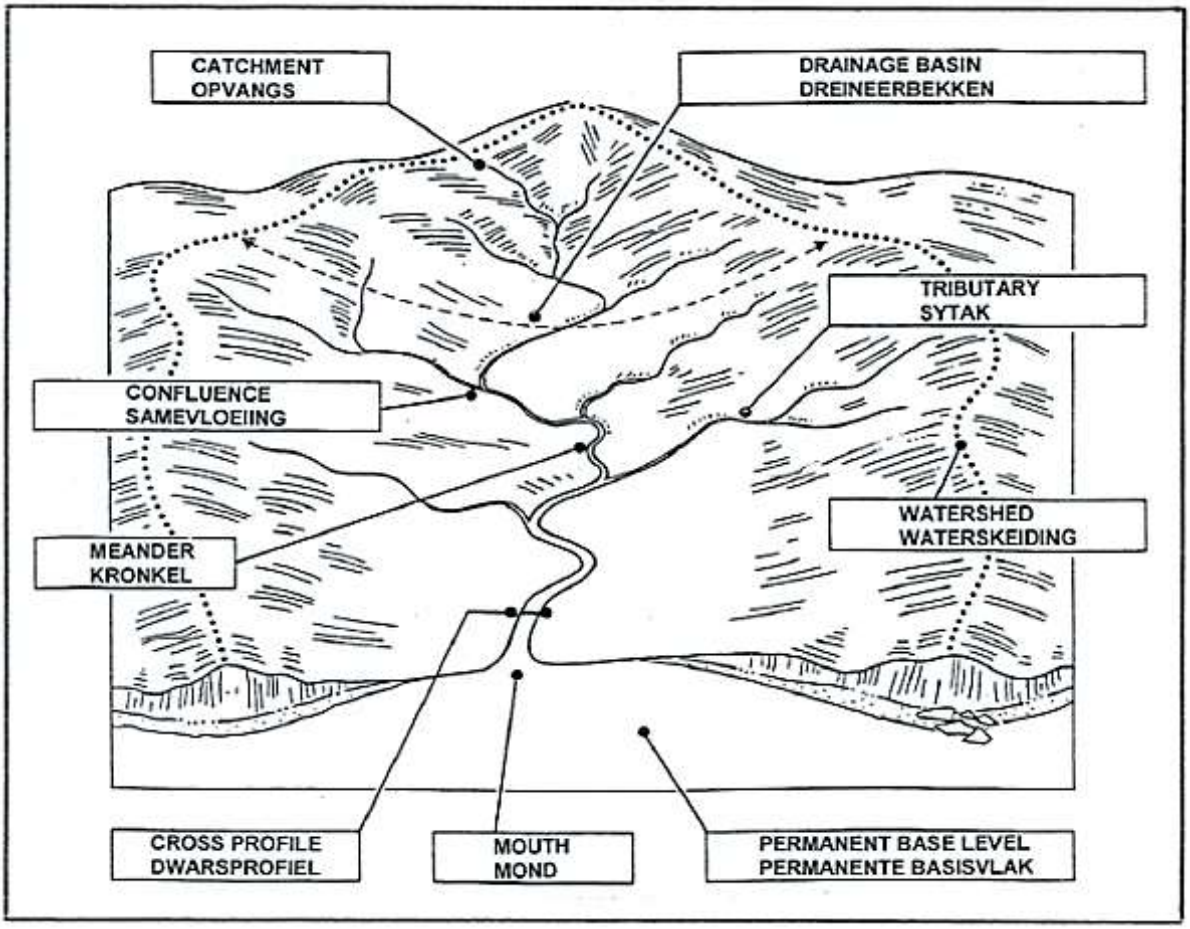
2.2 Describe the shapes of drainage basins A and B respectively. (2 x 2) (4)

2.3 List and explain any FOUR factors that could influence the run-off in a river. (4 x 2) (8)

2.4 Suppose a rain shower of 100 mm occurs in each of drainage basins A and B. Which of the flow hydrographs (C – F) will most likely represent stream flow at the point marked = in drainage basins A and B respectively? (2 x 2) (4)

QUESTION 3: 8 minutes 10 marks *(Adapted from Nov. 2008)*

3. Use the figure below which shows the different fluvial processes and characteristics of a drainage basin to assist you to give ONE term for each of the descriptions below. Write only the term next to the question number as an answer, for example 3.6 base flow.



© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

3.1 Area where a river gets its water from
3.2 Area drained by a river and its tributaries
3.3 The point where a tributary meets the main stream
3.4 Section of a stream from one bank to the other
3.5 High-lying area that separates two drainage basins (5 x 1) (5)
3.6. Identify the drainage pattern of this river system. (1 x 1) (1)
3.7. Differentiate between the cross and longitudinal profiles of rivers. (2 x 2) (4)

QUESTION 4: 20 minutes 28 marks *(Nov. 2008)*

4. FIGURE 4 A illustrates a drainage basin. FIGURE 4 B shows the three river courses associated with a river system. Examine both diagrams carefully.

Figure 4 A

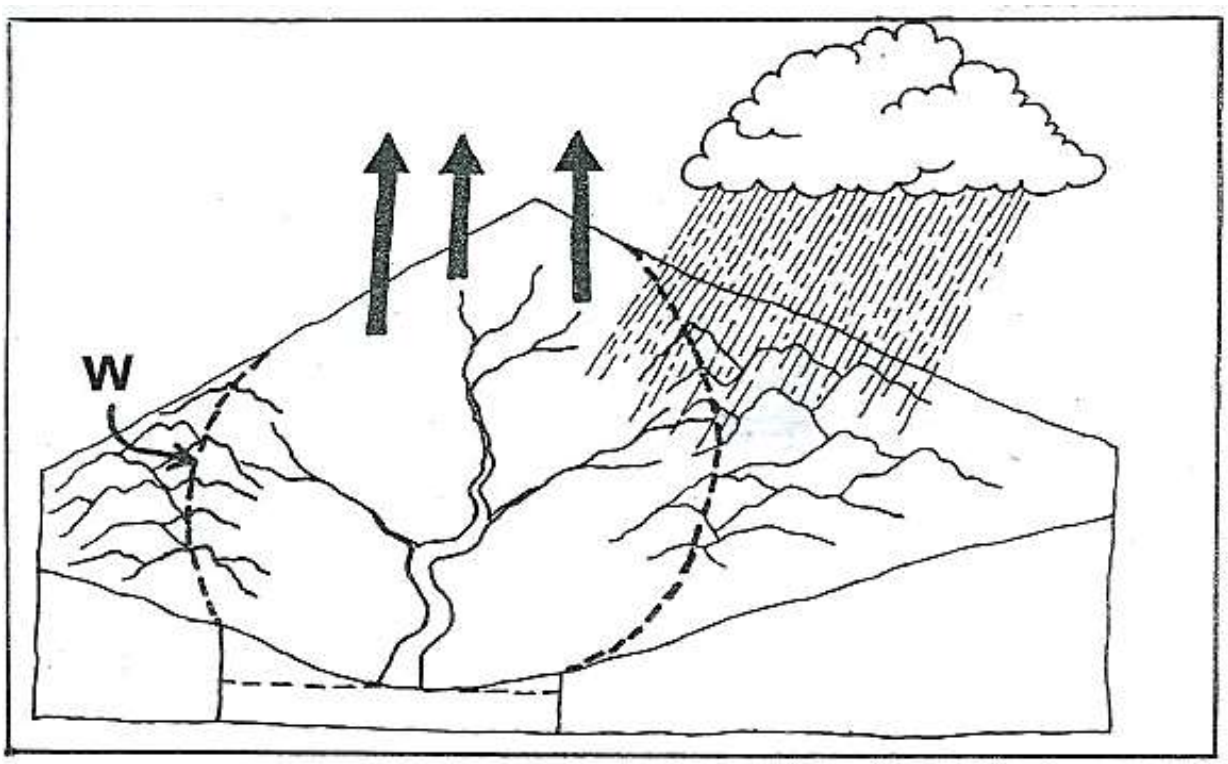
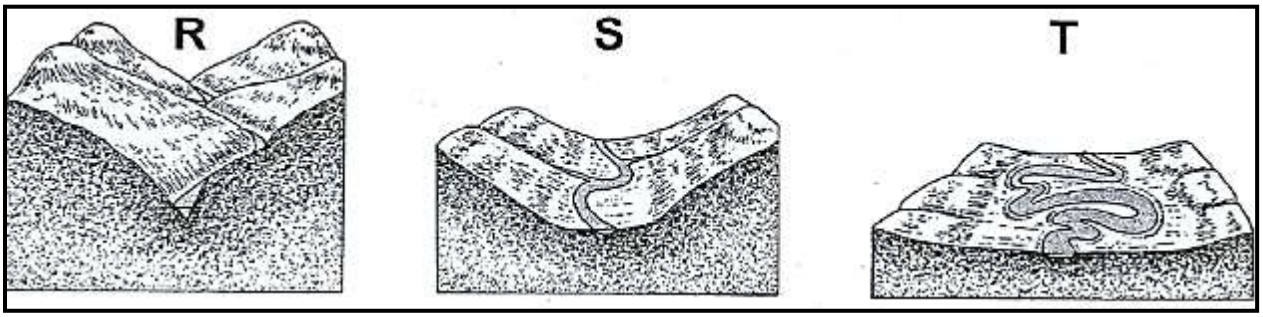


Figure 4 B



© Gauteng Department of Education

4.1 (a) The drainage basin illustrated in FIGURE 4A shows a *low drainage density (coarse texture)*. What does this mean? (1 x 2) (2)

(b) Give TWO possible reasons why this drainage basin has a low drainage density (coarse texture). (2 x 2) (4)

(c) Explain why the two factors mentioned in QUESTION 4.1(b) will result in a low drainage density (coarse texture). (2 x 2) (4)

(d) Give the formula to calculate drainage density. (1 x 2) (2)

4.2 (a) Identify the THREE main river courses labelled **R**, **S** and **T** in FIGURE 4 B respectively. (3 x 2) (6)

(b) Along which ONE of the three courses labelled **R**, **S** or **T** will flooding most likely occur? (1 x 2) (2)

(c) Explain how the characteristics of the river course mentioned in QUESTION 4.2(b) will promote flooding here. (2 x 2) (4)

(d) Flooding along the river course named in QUESTION 4.2(b) can be both a blessing and a curse for the people living on the adjacent flood plain. Explain this statement. (2 x 2) (4)

(e) State ONE method that can be introduced to reduce flooding along the river course named in QUESTION 4.2(b). (1 x 2) (2)

QUESTION 5: 8 minutes [10]

HINT: Each question in the exam starts with 15 marks short questions on definitions.

EcoleBooks

5 Give one word or a phrase for each of the definitions listed below.

5.1 A high lying area separating two drainage basins.

5.2. The drainage pattern that occurs when streams flow inwards towards a central depression

5.3. When a more energetic river lengthens its channel upstream at the expense of a less energetic river.

5.4 If a river's load is less than its capacity and the stream can collect more material through erosion it is said to be_____ .

5.5. The term used to describe the place where two river meet.

5.6. A drainage basin draining parallel ridges and valleys.

5.7. The point at which river capture takes place.

5.8. The lowest level to which a river can erode.

5.9. A drainage pattern where the tributaries join the main stream at a 90º angle and there are 90º angles in the main streams and tributaries.

5.10. The area drained by a river and its tributaries. (10 x 1) (10)

© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

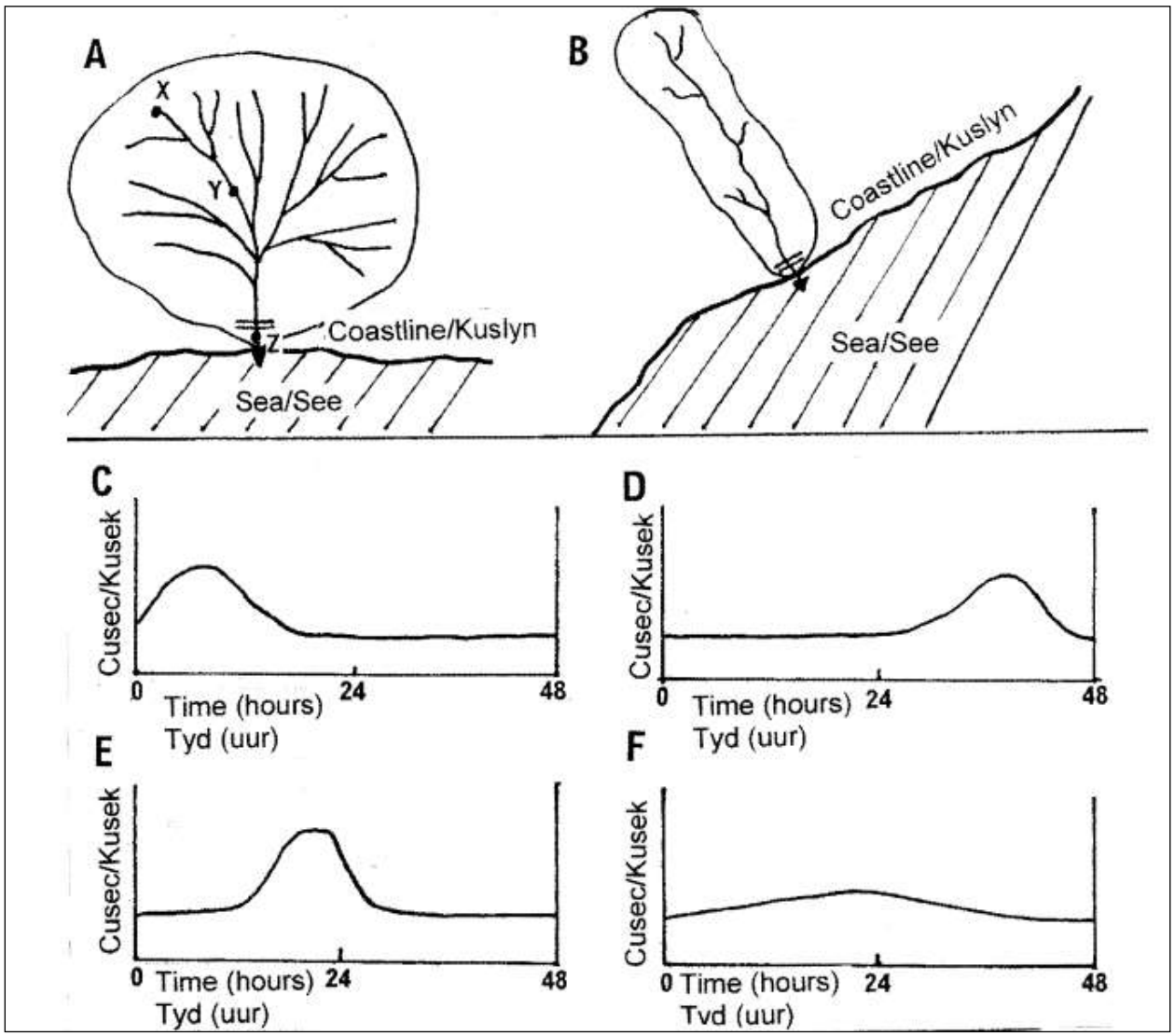
Download more resources like this on ECOLEBOOKS.COM

QUESTION 6: **20 minutes** **20 marks** *(Source: DoE March 2010)*

Refer to FIGURE 6 (A – F) representing the drainage basins of two river systems (A and B) and flow hydrographs (C – F) to show run-off in rivers after rain showers. Also read the extract on floods below.

Flooding occurs when water overflows its normal channels such as streams and storm water drains. Floods may also occur when there is an accumulation of water by drainage into areas which are not normally submerged. Floods are common in South Africa following long periods of drought. Drought, overgrazing and the deterioration of the land make the ecosystem vulnerable. Humans can alter the flow characteristics of a river negatively by clearing vegetation, constructing impermeable tar and concrete surfaces, and building on a river's flood plain.

FIGURE 6



© Gauteng Department of Education

6.1. Define the following terms referred to above:

(a) Drainage basin (1 x 2) (2)

(b) River system (1 x 2) (2)

6.2 Describe the shapes of drainage basins A and B respectively. (2 x 2) (4)

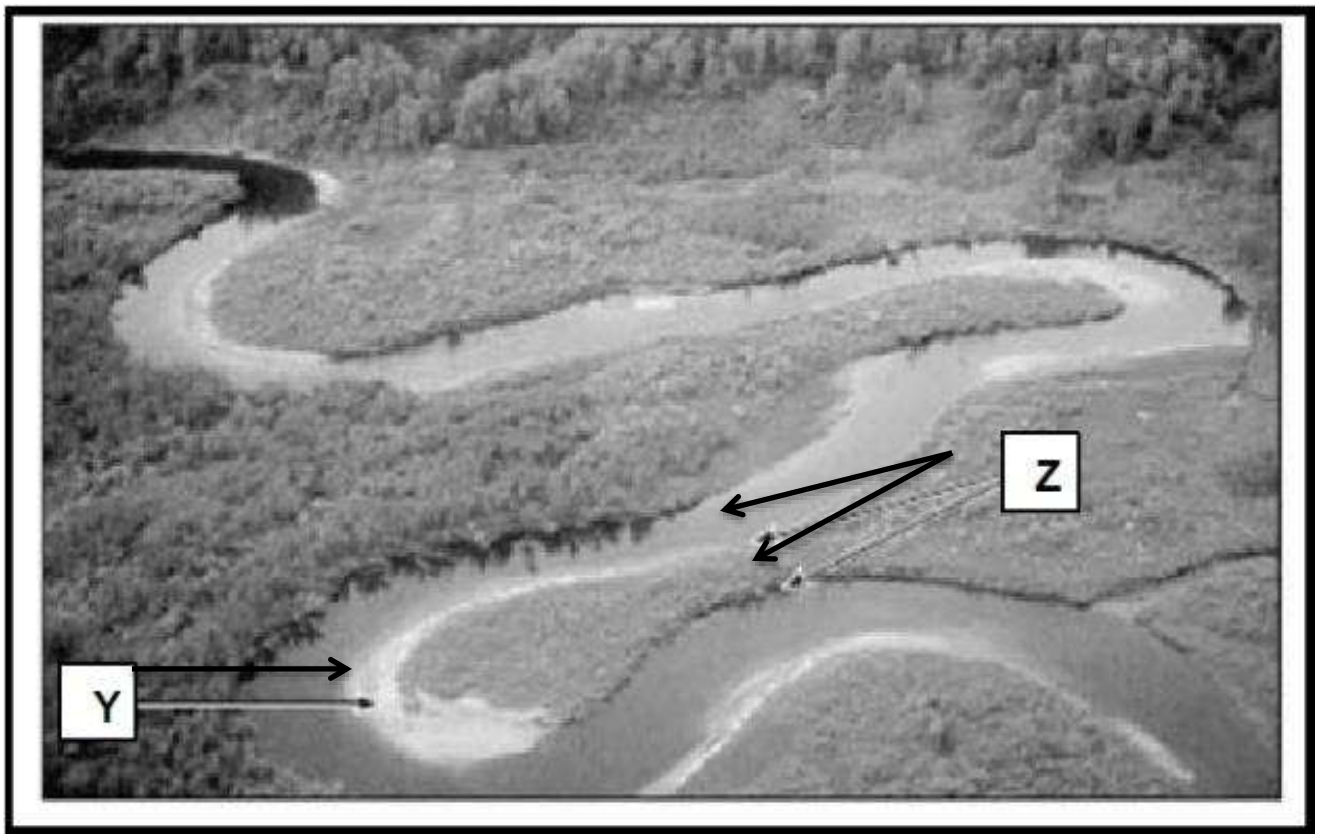
6.3 List and explain any TWO factors that could influence the run-off in a river. (4 x 2) (8)

6.4 Suppose a rain shower of 100 mm occurs in each of drainage basins A and B. Which of the flow hydrographs (C – F) will most likely represent stream flow at the point marked = in drainage basins A and B respectively? (2 x 2) (4)

QUESTION 7: 13 minutes (16) (Adapted from November 2010)

HINT: You must be able to identify features from photographs as well.

7. Study the figure below showing a photograph of a section of a river. Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A – D) next to the question number



© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

7.1. The feature labelled Y is a/an …

A undercut slope.
B slip-off slope.
C ox-bow lake.
D dip slope.

7.2 The section of the river shown in the photograph is in its … course.

A upper
B middle
C lower
D base

7.3 During a flood the river is likely to break through at point Z, resulting in the formation of a/an …

A rapid.
B ox-bow lake.
C meander.
D floodplain.

7.4 The river shown in this photograph flows throughout the year and is therefore referred to as …

A episodic.
B permanent/perennial.
C seasonal.
D periodic.

ÉcoleBooks

7.5 The river shown in this photograph displays a … stream channel pattern.

A dendritic
B braided
C rock-controlled
D meandering (5 x 1) (1)

7.6.1. Draw a simple well labelled cross section to illustrate the cross / transverse profile of the river at Y. (3 x 1) (3)

7.6.2. Write a paragraph and explain how the feature labelled Z will change during a flood or as erosion takes place. Refer to the fluvial landforms that will develop over time. (4 x 2) (8)

© Gauteng Department of Education

Question 8: 24 Minutes [30] (Adapted from Exemplar 2008)

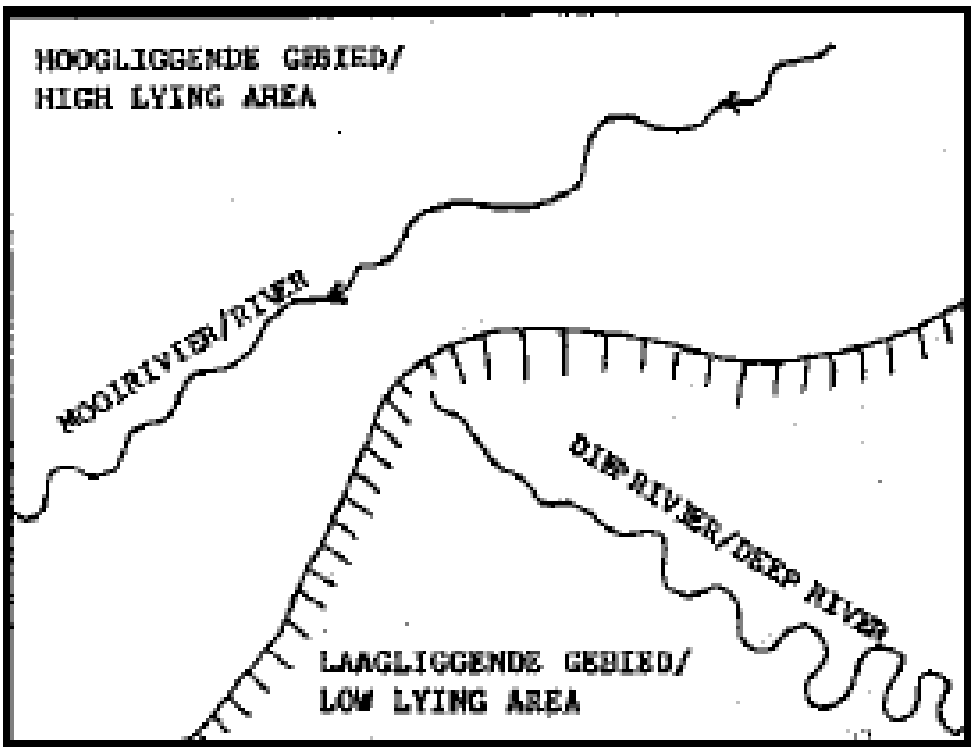
8. The diagram below shows a plan view of an area in which two rivers are situated on two different levels. Figure 8.1 shows the longitudinal profiles of the two streams before river capture / piracy. In time river capture / piracy will take place.

8.1. a) Draw a labelled sketch (plan view) showing the features of this landscape after river capture/piracy has taken place. (5)

b) Name the erosion process responsible for the river capture/piracy. (1 x 1 = 1)

c) What will happen to the position of the watershed in time? (1 x 2 = 2)

Figure 8.1.



8.2. After river capture rejuvenation will occur.

a) Which one of the two streams will be rejuvenated? (1 x 2 = 2)

b) How will the discharge and the erosive capacity of the rejuvenated stream change? (2 x 2 = 4)

c) Draw a labelled diagram to show the longitudinal profile of the rejuvenated stream. (2 x 2 = 4)

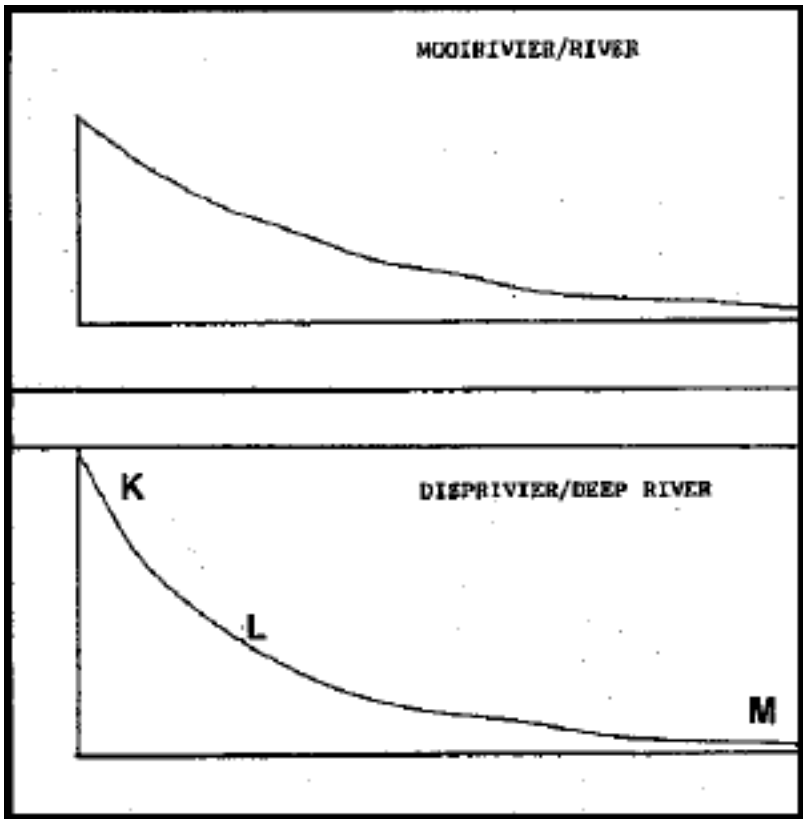
© Gauteng Department of Education

DOWNLOAD MORE RESOURCES LIKE THIS ON ECOLEBOOKS.COM

Download more resources like this on ECOLEBOOKS.COM

8.3 Use the sketches of the longitudinal profiles of the rivers to answer the questions:

Figure 8.2



8.4. a) Identify the stages of the river as represented by the positions K, L and M. (3)

b) Draw cross section profiles at each of the positions K, L and M. (3)

c) Explain why each of the profiles differ. (3 x 2 = 6)

© Gauteng Department of Education