



JENN

Training and Consultancy

The path to enlightened education

SUBJECT: LIFE SCIENCES

GRADE 12

2023 SPRING CLASSES

TEACHER AND LEARNER CONTENT MANUAL

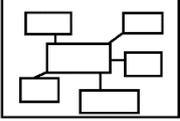
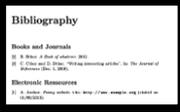
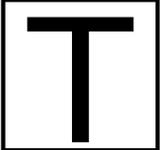
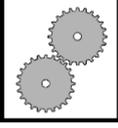
Topics

- 1. Evolution**
- 2. Plant hormones**
- 3. Central nervous system**
- 4. Protein synthesis**
- 5. Homeostasis**

**CONTENTS****PAGE**

<u>TOPIC 1: Evolution</u> <ul style="list-style-type: none">○ Examination guideline and outcomes○ Important terms and definitions○ Worked examples.○ Activities	5-42
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ICON DESCRIPTION

 <p>MIND MAP</p>	 <p>EXAMINATION GUIDELINE</p>	 <p>CONTENTS</p>	 <p>ACTIVITIES</p>
 <p>BIBLIOGRAPHY</p>	 <p>TERMINOLOGY</p>	 <p>WORKED EXAMPLES</p>	 <p>STEPS</p>



EVOLUTION EXAMINATION GUIDELINE EVOLUTION

CONTEN	ELABORA
Introduction	<ul style="list-style-type: none">□ Definition of biological evolution change in the characteristics of species over time□ Difference between a hypothesis and a theory
Evidence for evolution	<ul style="list-style-type: none">□ Role of the following as evidence for evolution:<ul style="list-style-type: none">• Fossil record – Link to Grade 10• Biogeography – Link to Grade 10
Variation	<ul style="list-style-type: none">□ Definition of a biological species and a population□ A review of the contribution of each of the following to variation that exists amongst individuals of the same species:<ul style="list-style-type: none">• Meiosis<ul style="list-style-type: none">○ Crossing over○ Random arrangement of chromosomes• Mutations• Random fertilisation• Random mating

CONTENT	ELABO
Origin of an idea about origins (a historical Lamarckism (Jean Baptiste de Lamarck –	<ul style="list-style-type: none">□ Ideas on evolution in the order of their origin are as follows:<ul style="list-style-type: none">• Lamarckism• Darwinism□ Lamarck used two 'laws' to explain evolution:<ul style="list-style-type: none">• 'Law' of use and disuse• 'Law' of the inheritance of acquired characteristics

<p>Darwinism (Charles Darwin – 1809–1882)</p>	<p>☐ Darwin's theory of evolution by natural selection:</p> <ul style="list-style-type: none"> • There is a great deal of variation amongst the offspring. • Some have favourable characteristics and some do not. • When there is a change in the environmental conditions or if there is competition, • then organisms with characteristics, which make them more suited, survive • whilst organisms with unfavourable characteristics, which make them less suited, die. • The organisms that survive, reproduce • and thus, pass on the allele for the favourable characteristic to their offspring. • The next generation will therefore have a higher proportion of individuals with the favourable characteristic.
<p>Punctuated Equilibrium (Eldredge and Gould – 1972)</p>	<p>☐ Punctuated Equilibrium explains the speed at which evolution takes place:</p> <ul style="list-style-type: none"> • Evolution involves long periods of time where species do not change or change gradually through natural selection (known as equilibrium). • This alternates with (is punctuated by) short periods of time where rapid changes occur through natural selection • during which new species may form in a short period of time.
<p>Artificial selection</p>	<p>☐ Artificial selection involving:</p> <ul style="list-style-type: none"> • A domesticated animal species • A crop species

Formation of new species

- ❑ Biological species concept: similar organisms that are capable of interbreeding to produce fertile offspring
- ❑ Speciation and extinction and the effect of each on biodiversity
- ❑ Speciation through geographic isolation:
 - If a population of a single species becomes separated by a geographical barrier (sea, river, mountain, lake)
 - then the population splits into two.
 - There is now no gene flow between the two populations.
 - Since each population may be exposed to different environmental conditions/the selection pressure may be different
 - natural selection occurs independently in each of the two populations
 - such that the individuals of the two populations become very different from each other
 - genotypically and phenotypically.
 - Even if the two populations were to mix again
 - they will not be able to interbreed.
 - The two populations are now different species.
- ❑ Speciation through geographic isolation in ONE of the following:
 - Galapagos finches
 - Galapagos tortoises
 - Plants on different land masses (linked to continental drift)
 - Baobabs in Africa and Madagascar
 - Proteas in South Africa and Australia
 - Any example of mammals on different land masses

CONTENT	ELABO
<p>Mechanisms of reproductive isolation (Keeping species separate)</p>	<p>□ A brief outline of reproductive isolation mechanisms that help to keep species separate:</p> <ul style="list-style-type: none"> • Breeding at different times of the year • Species-specific courtship behaviour • Plant adaptation to different pollinators • Infertile offspring • Prevention of fertilisation
<p>Evolution in present times</p>	<p>□ Any ONE example of natural selection and evolution in present times:</p> <ul style="list-style-type: none"> • Use of insecticides and consequent resistance to insecticides in insects • Development of resistant strains of tuberculosis-causing bacteria (MDR and XDR) to antibiotics, due to mutations (variations) in bacteria and failure to complete antibiotic courses • HIV resistance to antiretroviral medication • Bill (beak) and body size of Galapagos finches

<p>Evidence of common ancestors for living hominids, including humans</p>	<ul style="list-style-type: none"> □ Interpretation of a phylogenetic tree to show the place of the family Hominidae in the animal kingdom □ Characteristics that humans share with African apes □ Anatomical differences between African apes and humans, with the aid of diagrams, as it applies to the following characteristics: <ul style="list-style-type: none"> • Bipedalism (foramen magnum, spine and pelvic girdle) • Brain size • Teeth (dentition) • Prognathism • Palate shape • Cranial ridges • Brow ridges □ Lines of evidence that support the idea of common ancestors for living hominids including humans: <ul style="list-style-type: none"> • Fossil evidence: Evidence from fossils of different ages show that the anatomical characteristics of organisms changed gradually over time. • Emphasis on evolutionary trends provided by the anatomical features of fossils of the following three genera: <ul style="list-style-type: none"> ○ <i>Ardipithecus</i> ○ <i>Australopithecus</i>
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<p>Out-of-Africa hypothesis</p>	<ul style="list-style-type: none"> □ The Out-of-Africa hypothesis: Modern humans originated in Africa and then migrated to other continents □ Evidence for the 'Out-of-Africa' hypothesis: <ul style="list-style-type: none"> • Fossil evidence: information on each of the following fossils that serve as evidence for the 'Out-of-Africa' hypothesis: <ul style="list-style-type: none"> ○ <i>Ardipithecus</i> (fossils found in Africa only) ○ <i>Australopithecus</i> (fossils found in Africa only, including Karabo, Little Foot, Taung Child, Mrs Ples) ○ <i>Homo</i> (fossils of <i>Homo habilis</i> found in Africa only; oldest fossils of <i>Homo erectus</i> and <i>Homo sapiens</i> found in Africa, while the younger fossils were found in other parts of the world) • Genetic evidence: mitochondrial DNA □ Timeline for the existence of different species of the genus <i>Homo</i> and significant features of each of fossil type to show the differences amongst them □ Interpretation of phylogenetic trees proposed by different scientists showing possible evolutionary relationships as it applies to hominid evolution
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<u>TERMS</u> (alphabetical)	<u>EXPLANATION of the terms</u>
Adaptation	Changing to fit a niche or survive in an environment
Anatomy	Study of the structures of organisms
Artificial Selection	Characteristics selected by humans
Biogeography	Study of how species are distributed across the Earth
Biological Species	Individuals that can interbreed and produce viable(fertile) offspring
Cladistics	Method of classifying species in groups based on ancestral relationships
Cladogram	Diagram of how species are related
Creationism	Belief that a higher power created all life
Darwinism	Term commonly (wrongly) used as a synonym for evolution
Descent with Modification	Passing down traits that might change over time
Embryology	Study of the earliest stages of development of an organism
Eukaryote	Organism made of cells that have membrane-bound organelles
Evolution	
Fossil Record	All known traces of past life ever found
Genetics	Study of traits and how they are passed down from generation to generation
Gradualism	Changes in species that happen over long periods of time
Habitat	Area in which an organism lives
Homologous Structures	Body parts on different species that are similar and most likely evolved from a common ancestor – different functions
Macro-evolution	Changes in populations at the species level, including ancestral
Mass Extinction	Event in which large numbers of species died out completely
Micro-evolution	Changes in species at a molecular or gene level
Natural Selection	Characteristics that are favourable in an environment and are passed down while undesirable characteristics are bred out of the gene pool
Niche	Role an individual plays in an ecosystem
Organelle	Subunit within a cell that has a specific function
Phylogeny	Study of relative connections between species



Prokaryote	Organism made up of the simplest type of cell; has no membrane-bound organelles
Punctuated Equilibrium	Long periods of consistency of a species interrupted by changes that happen in quick bursts
Speciation	The creation of a new species, often from evolution of another species
Taxonomy	Science of classifying and naming organisms
Theory of Evolution	Scientific theory about the origins of life on Earth and how it has changed over time
Vestigial Structures	Body parts that seem to no longer have a purpose in an organism

EVOLUTION THEORIES

1. Jean Baptiste de Lamarck – 1744-1829 (Lamarckism)

Law of use and disuse

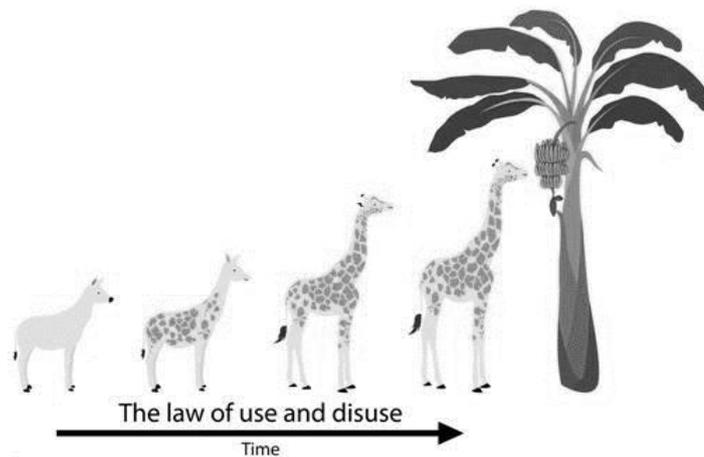
Changes in the environment create new needs that cause organisms to modify their existing organs to meet the need. Repeated use of the organ would cause it to enlarge and become more efficient. Disuse of a organ would cause it to degenerate

Law of inheritance

The modification an organism acquired during its lifetime could be pass on to its offspring

How to describe Lamarckism

Example:



Guiding Questions	Lamarck's explanation
<i>What was the original characteristic at the start?</i>	All giraffes had short necks originally
<i>What did the organism do?</i>	Giraffes frequently stretched
<i>Why did the organism do this?</i>	used their necks to reach -for leaves of tall trees/to feed
<i>What was the result?</i>	necks become longer
<i>What happened to this new characteristic?</i>	The long necks acquired in this way could be passed on to the next generation /were inherited
<i>What was the result of this?</i>	All the giraffes have long necks

refer to the characteristic (Long necks) – do not only state - the favorable characteristic was pass on to the next generation

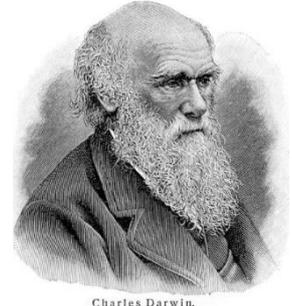
Explain that Lamarck's theory is not accepted by most life scientists today

Acquired characteristics ✓ are **not inherited** ✓ / do not cause any change to the DNA of an organism's gametes (sperms or ova) /

1. Darwinism (Charles Darwin – 1809–1882)

Darwin's theory of evolution by natural selection:

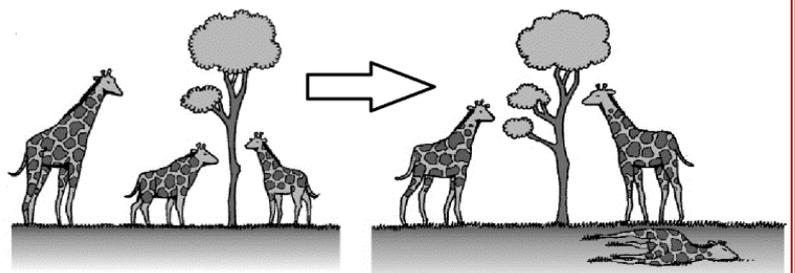
- There is a great deal of variation amongst the offspring.
- Some have favourable characteristics, and some do not.
- When there is a change in the environmental conditions or if there is competition,
 - then organisms with characteristics, which make them more suited, survive
 - whilst organisms with unfavourable characteristics, which make them less suited, die.
- The organisms that survive, reproduce
 - and thus, pass on the allele for the favourable characteristic to their offspring.
- The next generation will therefore have a higher proportion of individuals with the favourable characteristic.



Note the difference how to answer this from previous years

How to describe Darwinism

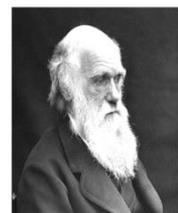
Example:



Natural Selection in action

Guiding Question	Darwin's explanation
State the characteristic that varies	There is a variation in the length of giraffe's necks.
Describe the variations	There were giraffes with long neck and short necks
Explain the environmental change/ selection pressure for natural selection	Leave/ food was only available on the top of the tree/higher trees and natural selection took place between giraffes with long necks and short necks for food
State the unfavorable characteristic and why it is unfavorable	Giraffes with short necks (unfavorable characteristic) could not get food from the top of a tree/higher trees, their neck was to short
Explain what happen to this individual with the unfavorable characteristics	The die of hunger
State the favorable characteristic and why it is favorable	Giraffes with long necks (favorable characteristic) could get food from the top of a tree/higher trees, their neck was to long enough
Explain what happen to this individual with the favorable characteristics	They could eat more leave/food and survive
What happen to the favorable characteristic	The giraffes with the long necks reproduce
	The allele for long necks will be passed on to the offspring
	The next generation of giraffes will have higher proportion with long necks

Differences between Lamarck's and Darwin



Lamarck's	Darwin
Variation of offspring brought about individuals in the population changing	Offspring inherit variation
Individuals want to change	Environmental factors working randomly
Change because of adaptation to environment	Natural selection – best suited to the environment to survive
Individuals in the population change	The population as a whole changes
Changes brought about by adaptation to the environment are inherited from parent to offspring	Characteristic are passed on from generation to generation to enable individuals to survive in the environment

1. Punctuated Equilibrium (Eldredge and Gould – 1972)

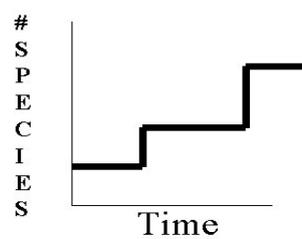
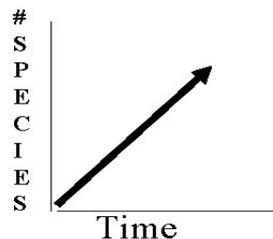
Punctuated Equilibrium explains the speed at which evolution takes place:

- Evolution involves long periods of time where species do not change or change gradually through natural selection (known as equilibrium).
- This alternates with (is punctuated by) short periods of time where rapid changes occur through natural selection
- during which new species may form in a short period of time

Punctuated equilibrium is supported by the absences of transitional fossils indication the period of rapid change

Graphs showing time frame of Evolution:

- **Gradualism:**
- **Punctuated Equilibrium**



Differences between Gradualism and Punctuated equilibrium

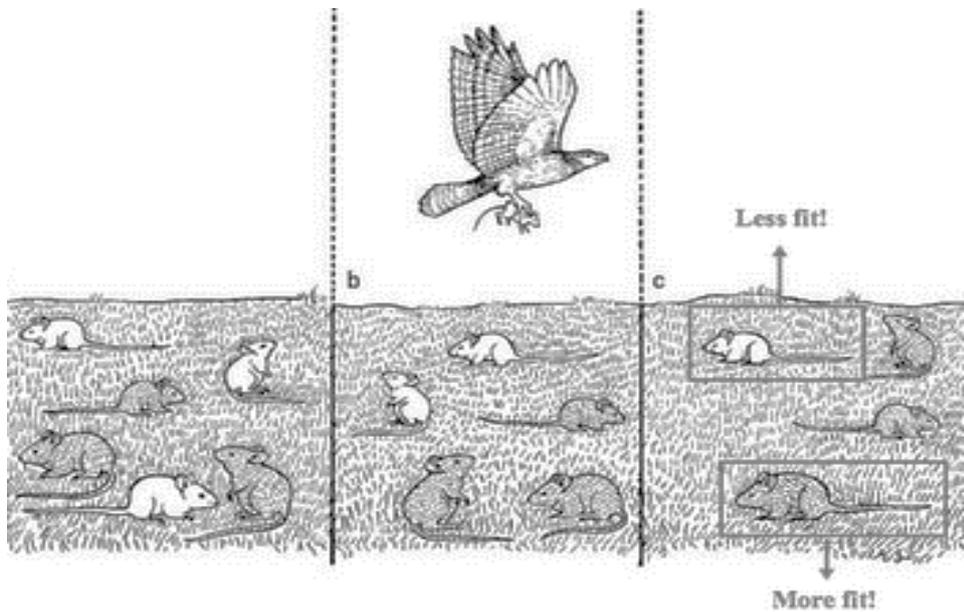
Natural selection		Punctuated equilibrium
Change is continuous and slow for many years	Time period	Change occurs during brief period of time
New species evolve through the accumulation of many small changes over a long time	Change of Species	Species exist unchanged for many years and then a short period of time there is a sudden change
Constant and consistent	Change in a population	Irregular and inconsistent
Supported by transitional form	Fossil record	Supported by lack of intermediate forms

NATURAL SELECTION

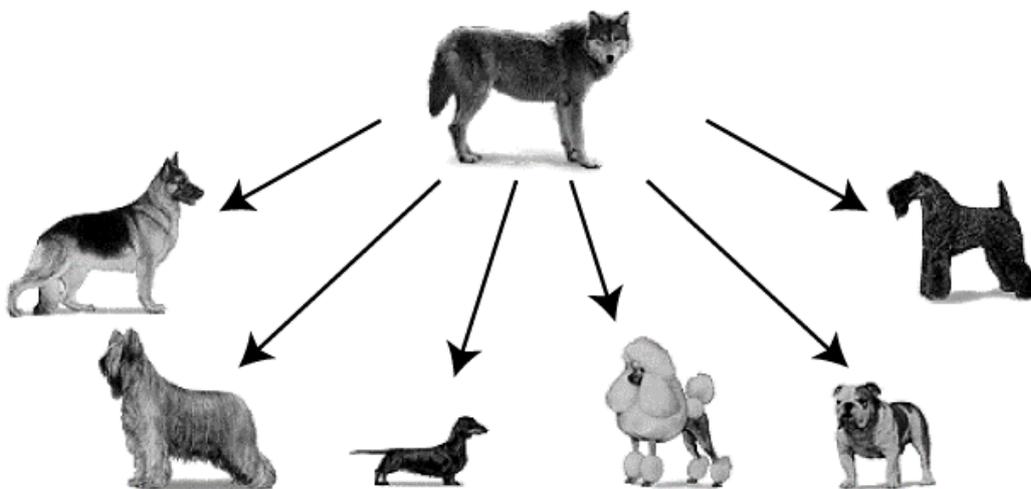
Natural selection VS Artificial selection

Natural selection	Artificial selection
Environment is the selective force	Human is selective force
Response is adaptation to nature	Response to satisfy human need
Happens in a species	Can include more than one species

Natural selection



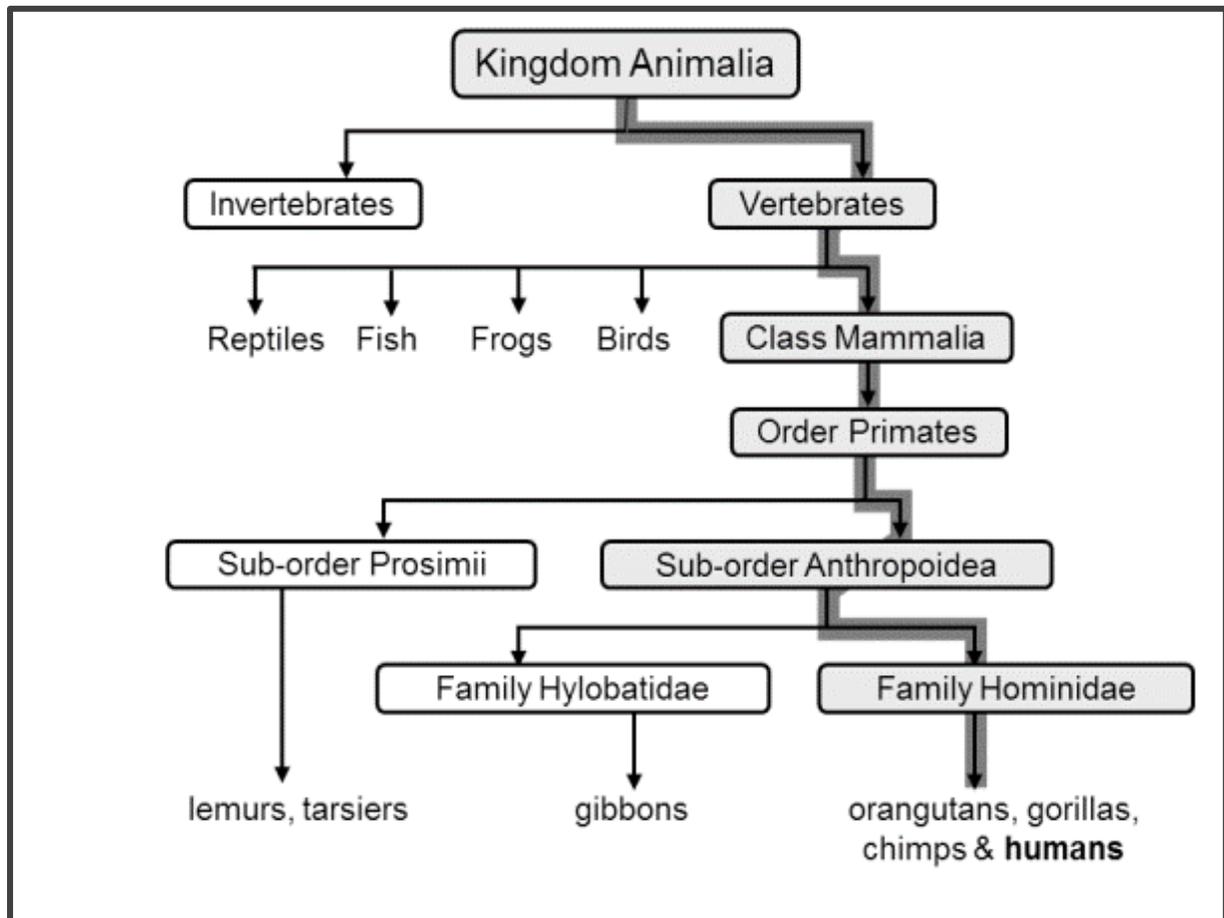
Artificial selection



HUMAN EVOLUTION

Human Evolution

1. The place of the family Hominidae in the animal kingdom



- Humans are mammals and belong to the class **MAMMALIA**, because their bodies are covered with hair and they suckle their young
- The order they belong to is **PRIMATES**. - Primates includes human, apes, orangutans, gorillas and chimpanzees
- The Family **HOMINIDAE** includes **HOMINIDS**

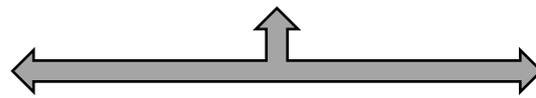
HOMINIDS

Great Apes

Orangutan

Gorilla

Chimpanzee



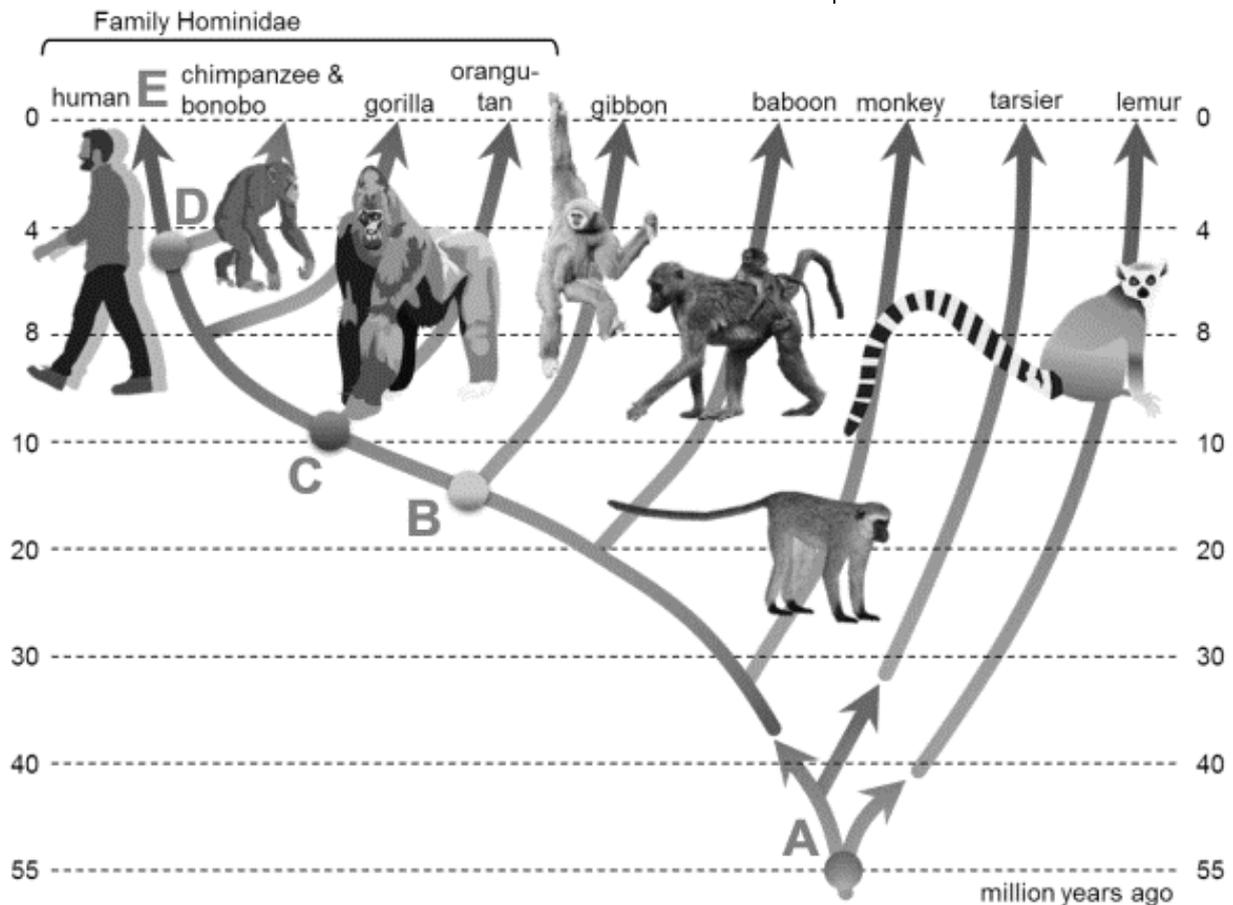
HOMININS

(bipedal)

Ardipithecus

Australopithecus

Homo



Note

Hominids refer to the great apes and humans and their fossil ancestors

Great Apes is also referring to as African Apes

Hominin – refers to bipedal organism

Ardipithecus, Australopithecus and early **Homo**- species are considered fossil ancestors of modern humans

Modern Humans are classified in the genus and species – **Homo sapiens**

Homo – sapiens

Genus – Homo

Specie- sapiens

The genus name and specie name must be underline / cursive

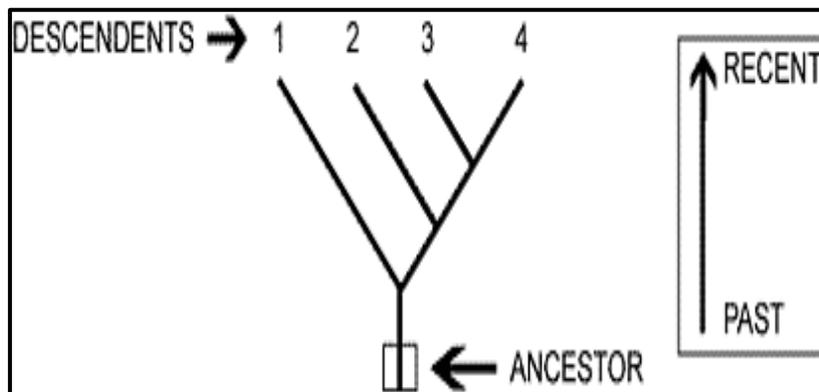
Read what the question asks – Give the Genus, specie, family, class or order name

2. Interpretation of a Phylogenetic tree to show humans place in the Animal Kingdom

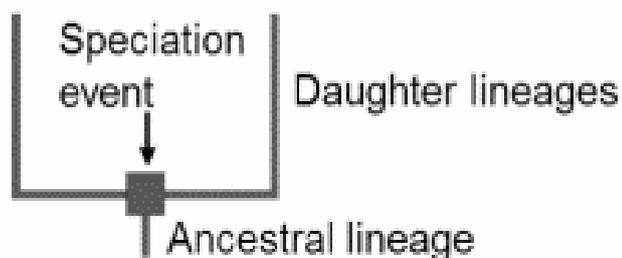
The evolutionary relationships of ancestral species and their descendants can be illustrated using a branching phylogenetic tree. A phylogenetic tree indicates which ancestors gave rise to which descendants.

How to interpret a Phylogenetic tree:

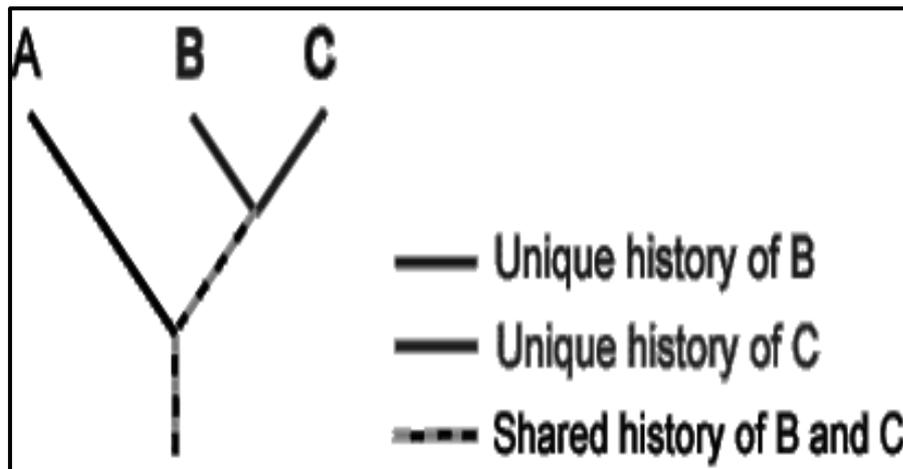
- The root of the phylogenetic diagram represents the ancestor, and the tips of the branches, the descendants of that ancestor. To move upwards is to move forward in time.



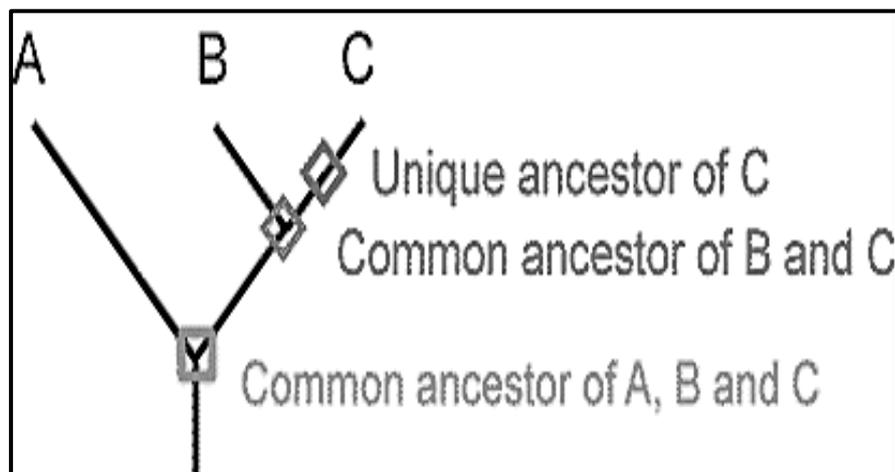
- Speciation is represented as a branching of the tree, as a single ancestral lineage gives rise to two or more daughter lines



- Each lineage has a part of its history that is unique and parts that are shared with other lineages, as illustrated below ...

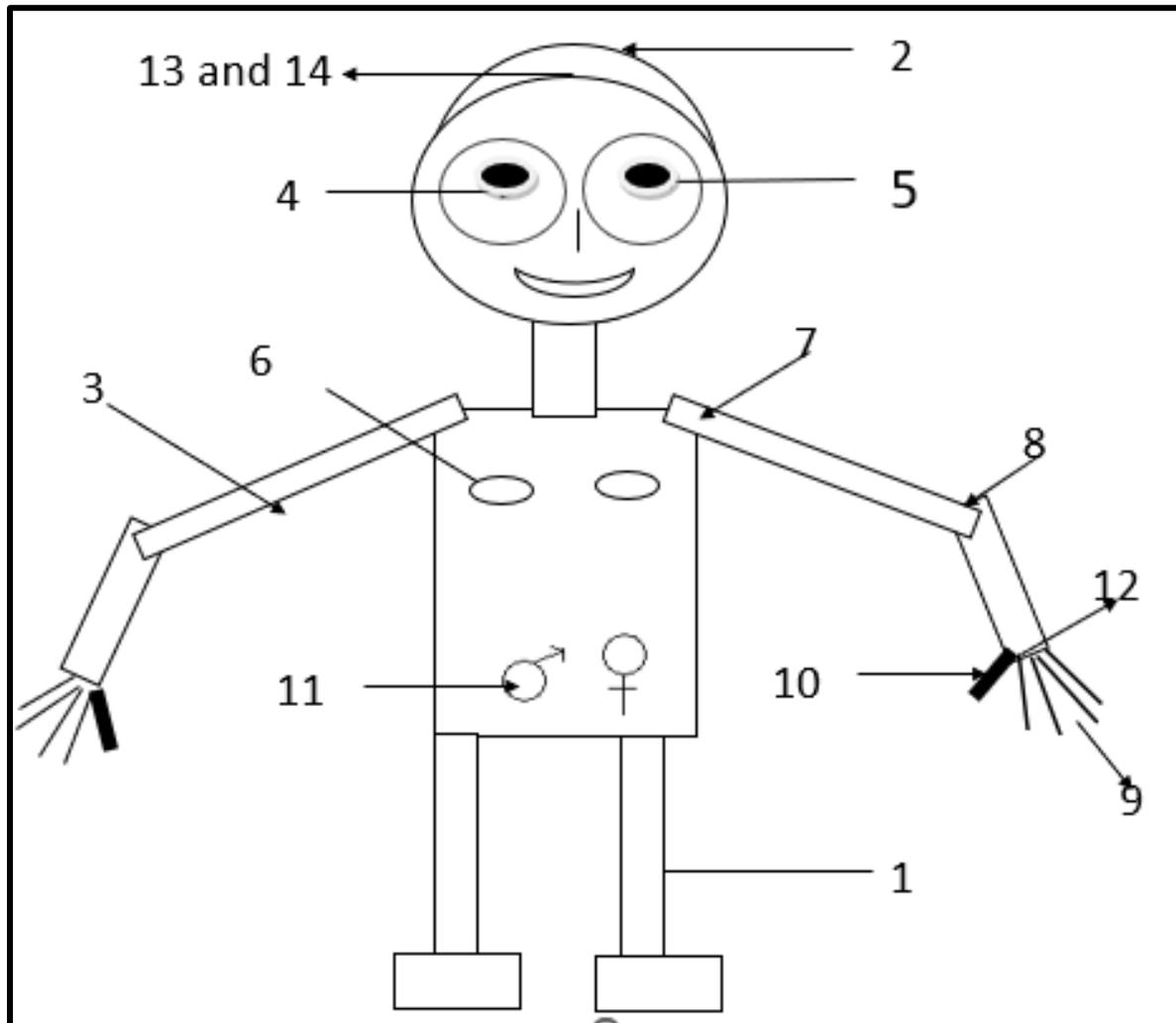


- And each lineage has ancestors that are unique to that lineage and common ancestors that are shared with other lineages



Humans vs African apes

1. Characteristics we share with other primates



1. **Upright posture:** the back limbs of hominids are generally stronger than their front limbs, enabling them to stand erect (upright) and use their hands for grasping; standing erect also gives a better view of surroundings and exposure of genitals to attract the opposite sex



2. **Large brains:** relative to their body size, hominids have larger brains than other species in the Animal Kingdom. This allows them to process and store information.
3. **Long upper arms / front limbs:** apes are normally **quadrupeds**, and this requires longer front limbs. Longer front limbs also make it easier to grasp and swing from branches.
4. **Two eyes in the front** of the head, this provides good binocular vision as both eyes work together.
5. The **eyes have cones** for colour vision that gives greater clarity.
6. **Two teats/nipples** only
7. **Freely rotating arms:** arms can be lifted above the head to swing from branch to branch, or to pick fruit hanging relatively high above the ground.
8. **Elbow joints allowing rotation of forearm** this allows the limb to extend or flex to grasp and reach for objects. It also enables the flexing and rotation of the wrists
9. **Bare fingertips or nails instead of claws:** Digits (finger and toes) have soft, broad, and very sensitive pads. The flat fingernails or toenails protect these pads.
10. **Opposable thumb:** the thumbs of hominids are positioned so that it can oppose other digits, enabling the hand to grip an object



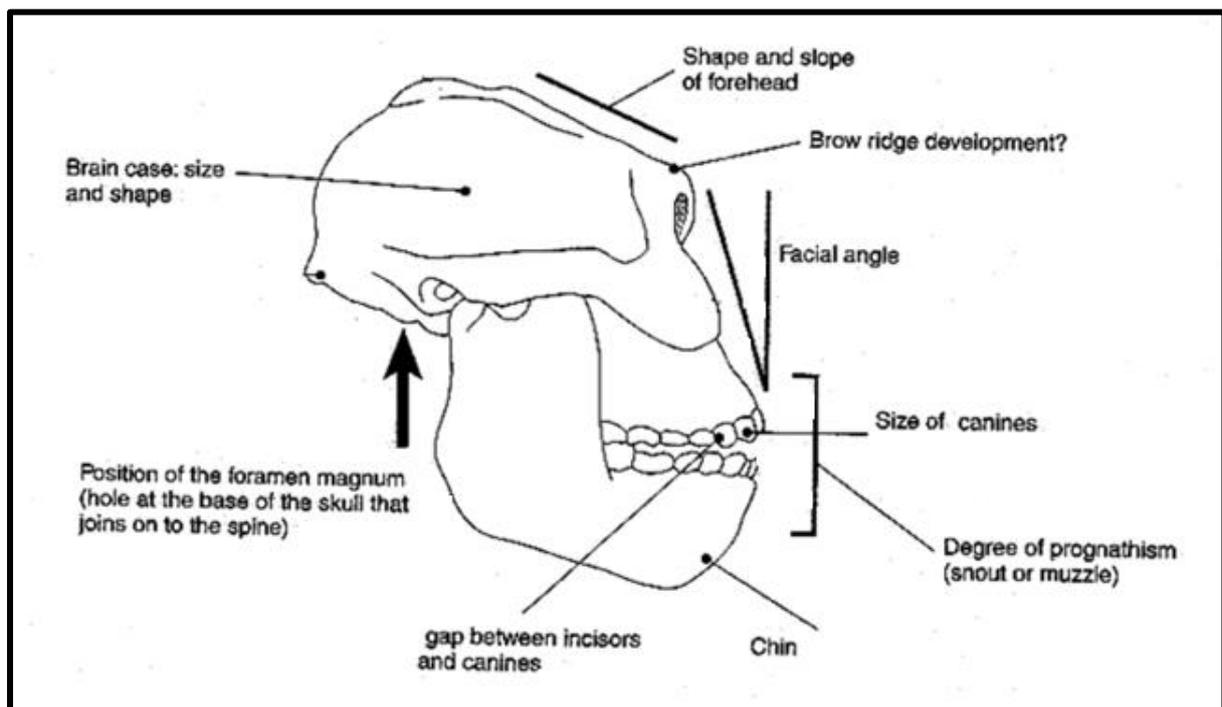
11. **Sexual dimorphism** – this refers to differences between males and females of the same species. Humans and apes are sexually dimorphic. This is linked to competition.
12. **Rotate hands at least 180°**
13. **Olfactory brain centres** reduced/reduced sense of smell
14. **Parts of the brain that process information from the hands and eyes are enlarged**

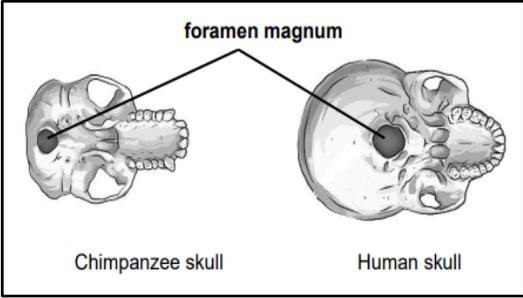
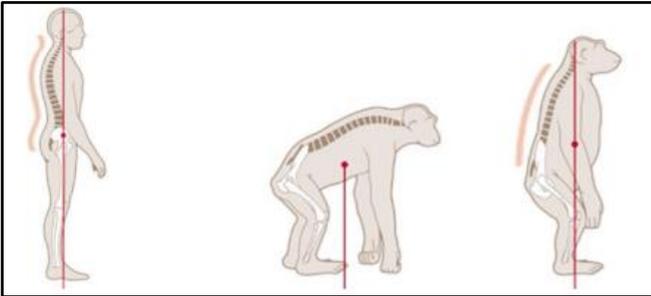


#Note

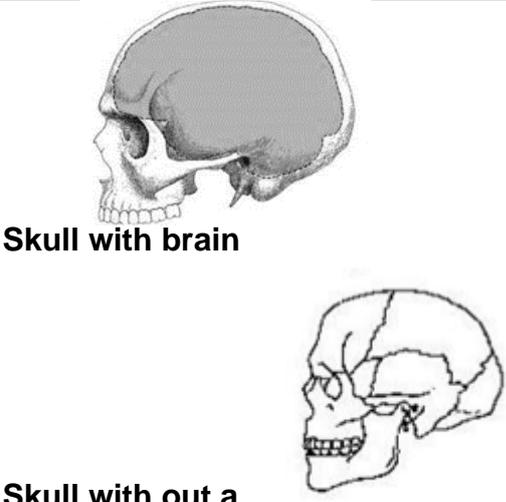
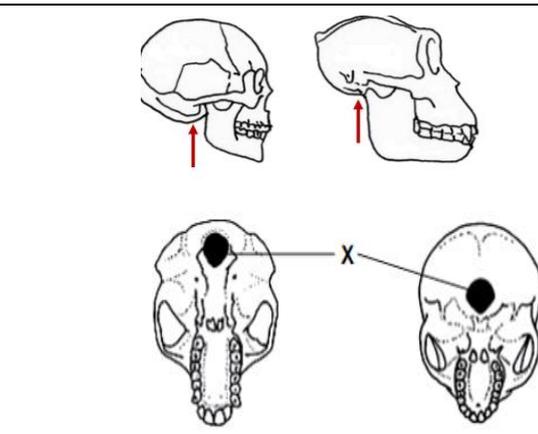
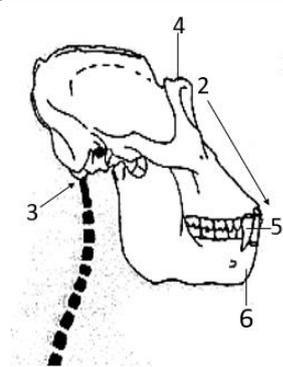
Correct way to state	Incorrect way
Large brain relative to body size	Not just large brain- elephants have large brain to
Two eyes in front of the head	Two eyes
Long upper arms	Long arms
Upright posture	Can stand up straight
Two teats/nipples	Two mammal glands
Freely rotating arms	Rotating arms
Elbow joints allowing rotation of forearm	Elbow rotate

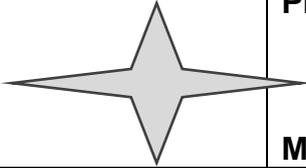
2. Anatomical differences between Africa apes and humans

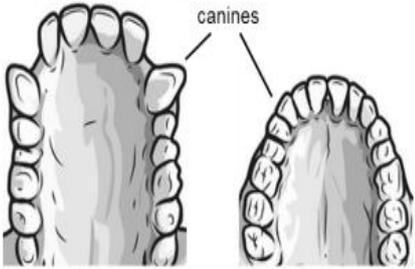


<i>Homo sapiens</i>	<i>Other primates</i>
1. Larger cranium	1. Smaller cranium
2. Flat face/ Forehead slope less backwards	2. Face sloping/ Foreheads slope more backwards
3. Foramen magnum more forward at the bottom of the skull	3. Foramen magnum more backwards Position at the bottom of the skull
	
4. Brow ridges are not well developed	4. Brow ridges are well developed
5. Smaller canines	5. Larger canines
6. Smaller spaces/diastema between the teeth	6. Larger spaces/diastema between the teeth
7. Jaws with teeth on a gentle/round curve/c - shape	7. Jaws with teeth in a rectangular/U shape
8. Jaws None – prognathous/ Less protruding jaw	8. Jaws prognathous/ More protruding jaw
9. Lower jaw has a well-developed chin	9. Lower jaw has poorly developed chin
10. No cranial ridge	10. Cranial ridges at the top of the cranium
11. Spine more curve/ S- shape	11. Less curve/ C- Shape
	
12. Pelvic gridle short and wide	12. Pelvic gridle long and narrow
13. Palate small and round	13. Palate long and rectangular

Mistakes made when answering anatomical differences/ visible differences

<p>Brain size- if the brain is not indicated in a diagram, you cannot state large brain and small brain when the question refers to visible differences.</p>	 <p>Skull with brain</p> <p>Skull with out a brain</p>
<p>Foramen magnum</p> <p>Human- <i>more forward position</i> African apes- <i>more backwards position</i></p> <p><i>In both cases you must refer to more forward/backwards position at the bottom of the skull</i></p>	
<p>Brow ridges are well or not well develop. (number 4)</p> <p>No marks will be allocated for:</p> <ul style="list-style-type: none"> • Big and small brow ridges • Visible and not visible • Prominent and not prominent 	
<p>Lower jaw has a well-developed chin or poorly develop chin (number 6)</p> <p>No marks will be allocated for:</p> <ul style="list-style-type: none"> • Prominent and not prominent • Big and small chin 	
<p>JAWS</p>	

<p>In Humans</p> <p>None – prognathous</p> <p>OR</p> <p>Less protruding</p>		<p>In African Apes</p> <p>Prognathous</p> <p>OR</p> <p>More protruding</p>
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<p>Teeth</p> <p>Canines is larger or smaller</p> <p>It is <u>canines</u> and not <u>teeth</u></p> <p>Not:</p> <p>Big and small</p> <p>Larger and shorter</p> <p>Larger and smaller teeth</p>	 <p>Chimpanzee Human</p>
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3. The significance of the structural changes that characterise the evolution of modern humans

Structure	Significance
<p>Foramen magnum</p> <p>The foramen magnum was in a backward position at the bottom of the skull in the ape-like beings✓ but in a forward position at the bottom of the skull in modern humans✓</p>	<p>This represents a change from quadrupedal in ape-like beings</p> <p>To bipedalism in modern humans, leading to the following in modern humans:</p> <ul style="list-style-type: none"> • Increased awareness of the environment in sensing danger/food • Freeing of the hands to use implements/carry objects/weapons/offspring • Exposure of a large surface area for thermoregulation S /lose body heat to surroundings in hot conditions/reduce overheating • Display of sex organs /breasts as part of courtship behaviour
<p>Cranium</p>	<p>This allowed space for a larger brain in humans than in ape-like beings, making the following possible:</p>

<p>Modern humans have a larger cranium than the ape-like beings</p> <p>Modern humans have a less sloping forehead than the ape-like beings</p> <p>Modern humans have a cranium that is more rounded than the ape-like beings</p>	<ul style="list-style-type: none"> • Better co-ordination of movement • Processing of a large amount of information • Processing information faster • Development of spoken and written languages to communicate
--	--

Structure	Significance
<p>Jaws</p> <p>Humans have jaws that are non-prognathous compared to the jaws of ape-like beings which are prognathous</p>	<ul style="list-style-type: none"> • This corresponds with a change in diet from hard, raw food^{✓^s} in the ape-like beings • To softer, cooked food^{✓^s} in humans
<p>Dentition/Teeth</p> <p>In ape-like beings there are gaps/diastema between incisors and canines but no gaps between the teeth in humans</p> <p>Humans have smaller canines than the ape-like beings</p> <p>Humans have flatter molars and pre-molars than the ape-like beings</p>	<ul style="list-style-type: none"> • This corresponds with the decreased need to bite and tear • and an increased need to grind and chew in humans • in view of the change in diet to soft, cooked food
<p>Chin</p> <p>In humans the chin is more developed compared to the ape-like beings</p>	<ul style="list-style-type: none"> • Developed chin assists with speech in humans
<p>Zygomatic arch</p> <p>In humans the zygomatic arch is less developed than in the ape-like beings</p>	<ul style="list-style-type: none"> • This corresponds with the decreased need for attachment of strong muscles • due to the decreased jaw size in humans
<p>Pelvis</p>	<ul style="list-style-type: none"> • Support greater weight due to the upright position

Humans have a (Wide and short) pelvis, apes have a (Long and Narrow pelvis)	
<p>Spine</p> <p>Humans' spine is more curve/ S- shape and ape-like beings is less curve/ C-Shape</p>	<ul style="list-style-type: none"> • For flexibility • Shock absorption

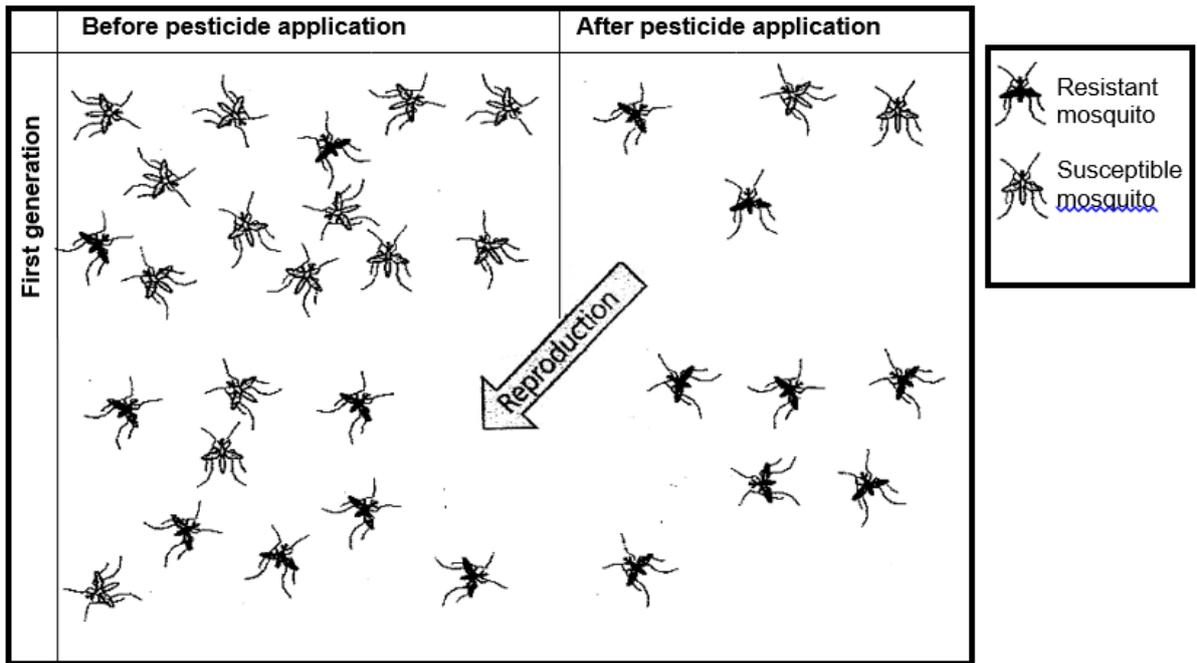
EVOLUTION TODAY

❖ **Examples of evolution by natural selection still occurring in present times:**

Insects which developed resistance to insecticides and bacteria developed resistance to antibiotics are examples of evolution by natural selection in present times.

❖ **Use of DDT and consequent resistance to DDT in insects can be explained in terms of natural selection**

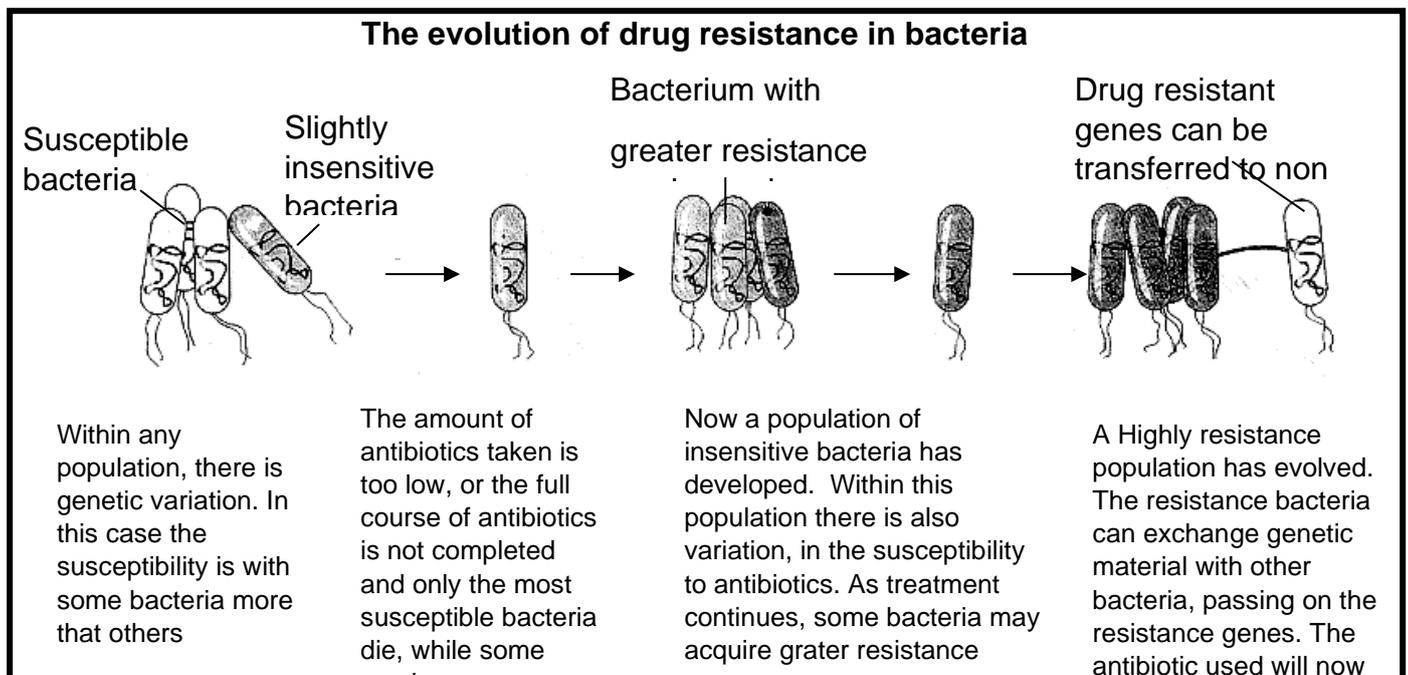
The introduction of DDT represents a change in the environment of the mosquito. The insecticide acts as a selective mechanism. Mosquitoes resistant to DDT would now survive and reproduce, while their susceptible cousins would die. And so the proportion of resistant mosquitoes in the population of that generation would increase by natural selection. In other words, a microevolution has taken place in the population. If DDT continues to increase to be used, then the proportion of DDT-resistant mosquitoes continues to increase and DDT is no longer effective in controlling this population.



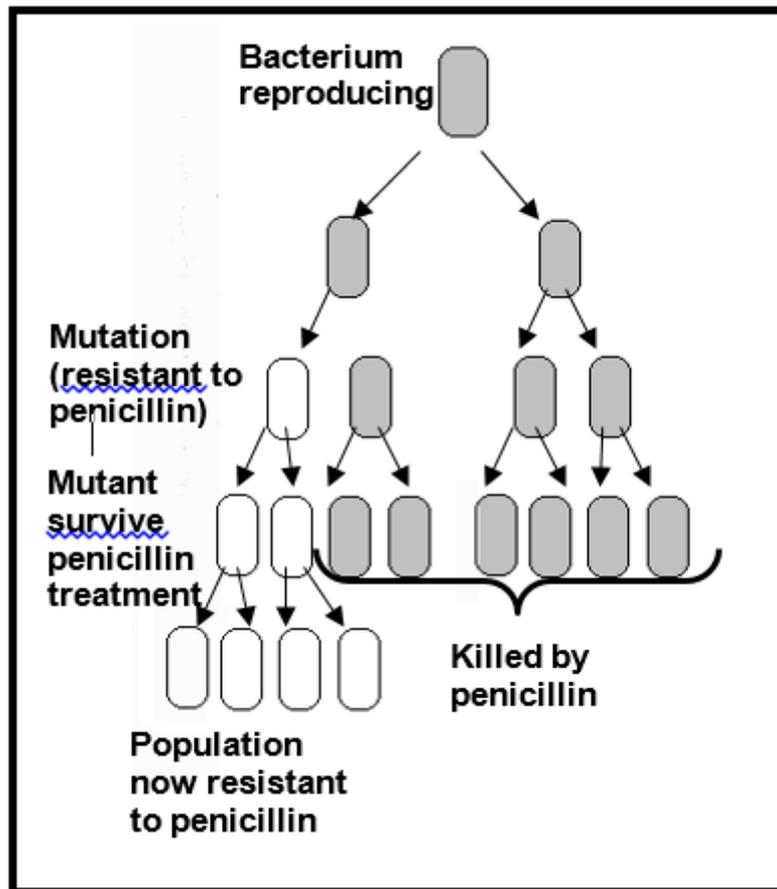
The development of DDT resistance in mosquitoes through natural selection

❖ **Development of resistant strains of tuberculosis-causing bacteria (MDR and XDR) to antibiotics**

As a result of their rapid generation times, changes in bacterial populations can show significant evolutionary changes in relative short periods of time. Some evolutionary changes in bacteria, such as the acquisition of antibiotic resistance can be a threat to human health. Antibiotics are drugs that fight bacterial infections. After their discovery in the 1940s, they transformed medical care and dramatically reduced illness and death from infectious bacterial diseases. However some bacteria have developed antibiotic resistance. Resistance infections inhibit the treatment of patients and increase patient mortality (death). The cumulative effect of antimicrobial resistance costs millions of rands every year.



Picture to show the development of bacteria for resistance against penicillin



Evolution: evolution theories

Activity 1

1

Brine shrimp are small arthropods found in saltwater lakes. During favourable conditions female shrimps produce eggs that hatch into live young. However, when conditions are unfavourable, the shrimp produce cysts. Each cyst contains the embryo covered with a hard, protective covering. In this state the embryo stops growing and is said to be dormant. The embryo can remain in this dormant state for many years and the cyst will only hatch at the optimum salt concentration. Scientists wanted to investigate which salt concentration resulted in the highest percentage of hatched cysts

They did the following:

- Prepared salt solutions of different concentrations: 0%, 0,5%, 1%, 1,5% and 2%
- Placed 30 ml of each solution into one of five beakers
- Took samples of brine shrimp cysts using a dropper
- Counted the number of cysts in each sample
- Recorded this as the initial number of cysts
- Placed the samples into each of the five beakers
- Left the beakers at room temperature for 48 hours
- Recorded the number of cysts that hatched in each beaker
- Calculated the percentage of cysts that hatched The results are shown in the table below

SALT CONCENTRATION (%)	NUMBER OF CYSTS USED AT THE START	NUMBER OF CYSTS THAT HATCHED	PERCENTAGE OF CYSTS THAT HATCHED
0	54	0	0
0,5	34	2	6
1	40	6	15
1,5	40	1	2,5
2	53	1	X

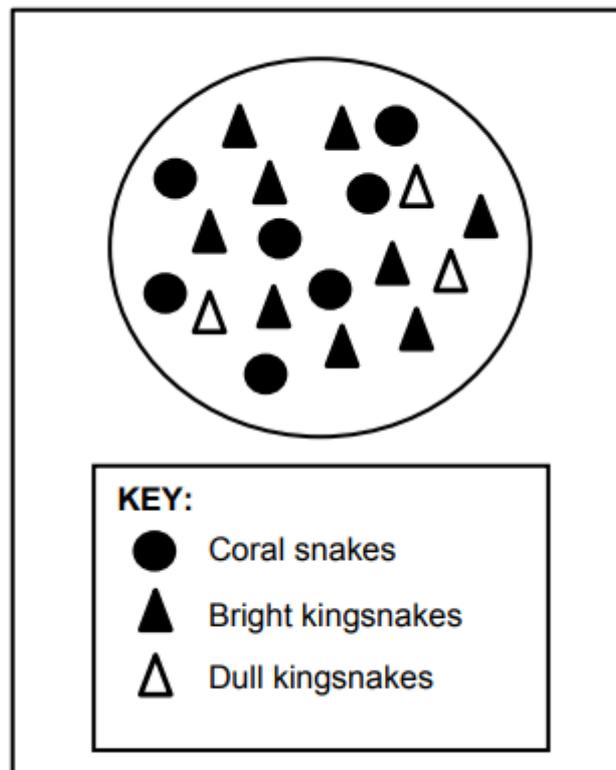
- 1.1 State TWO planning steps to consider before collecting the samples. (2)
- 1.2 State the:
- a) Independent variable (1)
 - b) Dependent variable (1)
- 1.3 Calculate the value of X in the table. Show ALL working. (3)

1.4 State THREE factors that were kept constant in order to ensure the validity of this investigation. (3)

1.5 Which salt concentration resulted in the highest percentage of hatched cysts? (1)

1.6 Use the theory of evolution through natural selection to explain how the ability to produce cysts led to the survival of the brine shrimp. (3)

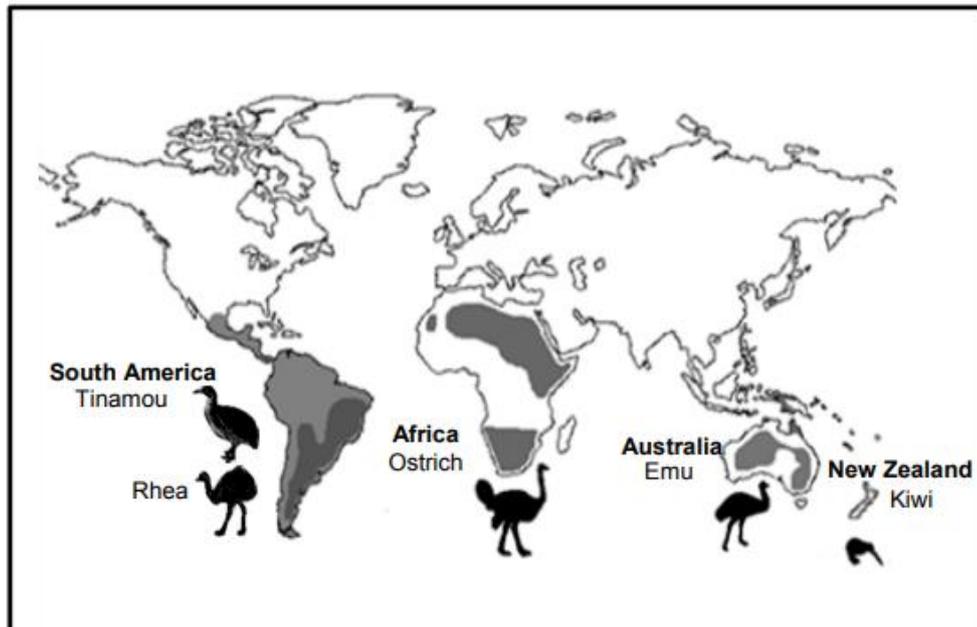
2 There are two variations in the colour of kingsnakes. Some have a bright colourful pattern and others have a dull pattern. Kingsnakes are non-poisonous to their predators. Coral snakes also have a bright colour pattern, but are poisonous to their predators. This is a defence mechanism as predators avoid them. Scientists observed that where kingsnakes shared the same habitat with coral snakes, there were more kingsnakes that had bright colourful patterns. The diagram below represents the distribution of the snakes



2.1 Explain how the bright colour pattern of coral snakes influences their survival. (3)

2.2 Use Darwin's theory of evolution through natural selection to explain why there are more brightly coloured kingsnakes in this habitat.

3 Flightless bird species that are currently distributed across different continents are shown in the picture below.



Scientists hypothesise that these species of flightless birds arose from a single common ancestor that was able to fly.

3.1 Describe how Lamarck would have explained the evolution of flightless birds (6)

Evolution Theories

Activity 2

1 Theories of evolution:

- A. Lamarckism
- B. Darwinism
- C. Punctuated equilibrium

Write the letter of the correct evolution theory next to the statement below.

1.1.	Inheritance of acquired characteristics	
1.2.	Only organisms best suited to the environment will survive	
1.3.	Long periods of little changes followed by short periods of rapid change	
1.4.	If structures are not being use, then the structure would become smaller and might disappear	

(4)

2 Name and explain the two laws of Lamack

(6)

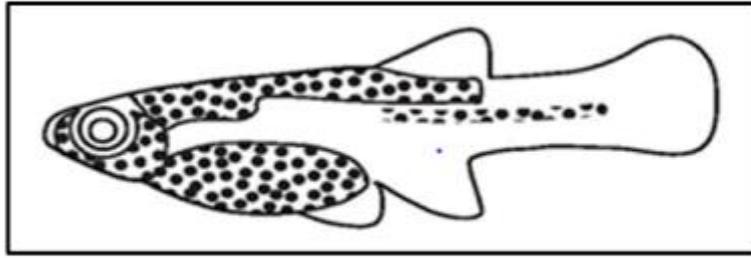
3 Describe the evolution theory of Eldrege and Gould.

(4)

4 Describe Darwin's theory of evolution by natural selection

(8)

5 5.1 A scientist used guppies (*Poecilia reticulata*) in an investigation to test Darwin's theory of natural selection. Male guppies have brightly coloured spots to attract females, but these spots also attract predators. It was previously observed that males living in streams where there were many predatory fish tended to have fewer spots. This reduced their risk of being eaten. Those males living in streams with fewer predators had more spots.



Guppy showing spots (adapted from www.decodedscience.org)

Those males living in streams with fewer predators had more spots
The procedure for the investigation was as follows: • Equal numbers of male and female guppies were put into two ponds (pond 1 and pond 2). • In pond 1, predatory fish that prey on guppies were introduced. • In pond 2, predatory fish that do not feed on guppies were introduced. • The guppies were allowed to breed for 20 months, representing several generations of guppies. (Guppies reproduce when they are about three months old.) The result of the investigation: The male guppies in pond 2 had significantly more spots than the male guppies in pond 1.

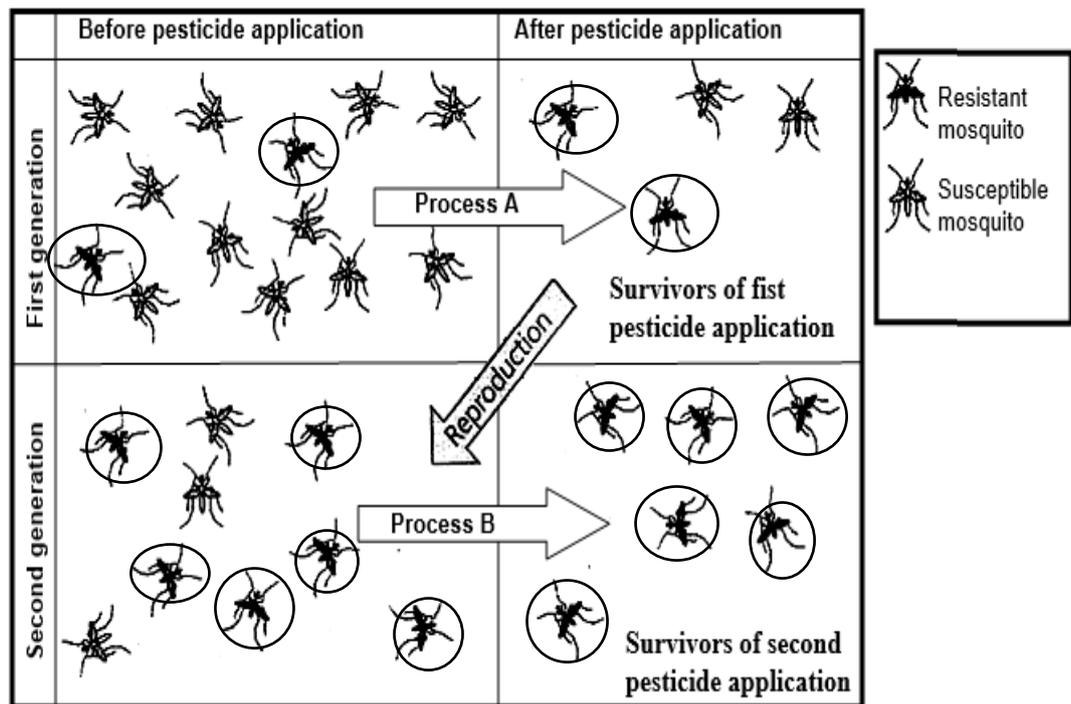
- 5.1.1 How could the validity of this investigation be increased? (3)
- 5.1.2 Identify the:
- a) Independent variable (1)
 - b) Dependent variable (1)
- 5.1.3 Explain why the scientist included pond 2 in this investigation (5)
- 5.1.4 Describe how Darwin's theory of natural selection can be used to explain why the guppies in pond 1 had fewer spots (6)
- 6 6.1 **The red-bellied black snake (*Pseudechis porphyriacus*) and the green tree snake (*Denderelaphis punctulatus*) are predators that sometimes feed on cane toads (*Bufo marinus*) that contain a toxin that may kill them. The snakes consume the toads by swallowing them whole. A decrease in the average jaw size of the snakes has been observed over a period of 70 years. Some scientists believe that this may be an example of punctuated equilibrium. With this change it was also noted that the snakes could no longer swallow the large cane toads. This has resulted in an increase in the survival of the snakes.**
- 6.1.1 Define punctuated equilibrium (5)

- 6.1.2 What characteristic of the toad species protects it from predation? (1)
- 6.1.3 Explain how the change in jaw size helped the snakes to survive (3)
- 6.1.4 How would Lamarck have explained the development of a small jaw size in the snakes? (6)
- 7 7.1 What type of characteristics does nature select during evolution (1)
- 7.2. In nature, there is always a fight for survival due to competition, predation and adverse weather conditions. Suggest a collective term for all these factors. (1)
- 7.3 Why is the concept of natural selection so important? (3)
- 7.4 Why is natural selection not a random process? (4)

Evolution in present times.

Activity 3

- 1 The introduction of DDT represents a change in the environment of the mosquito. Study the diagram and answer the questions (1)

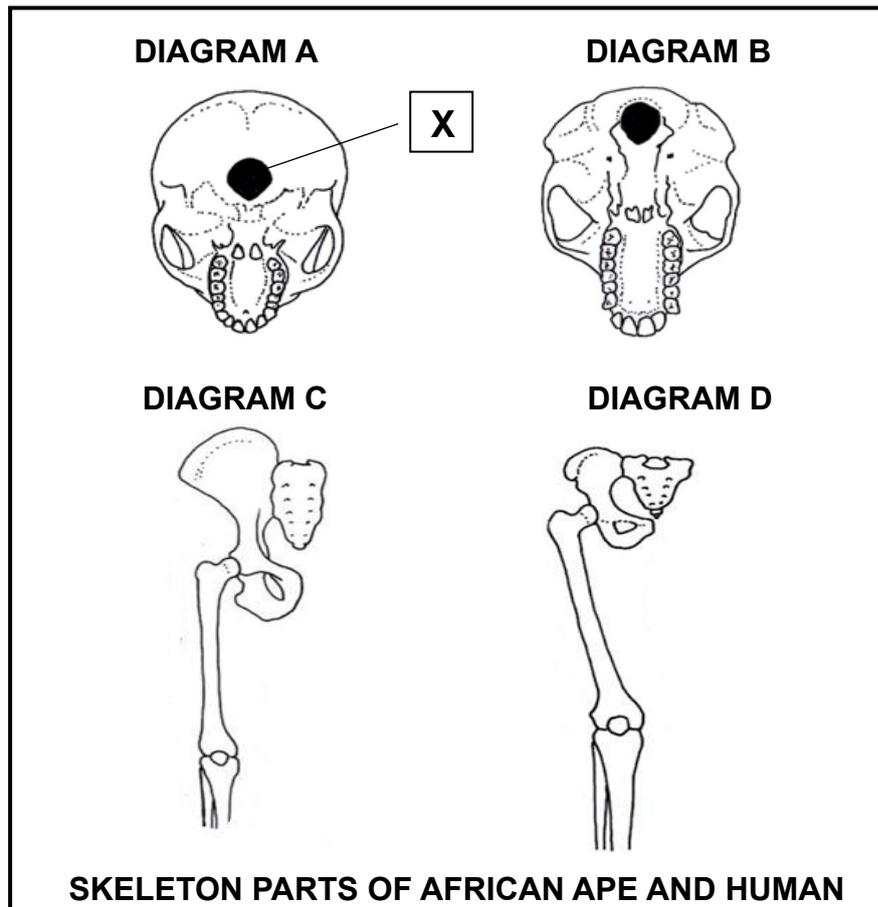


- 1.1. Give a suitable heading for the above diagram (2)
- 1.2. What process is represented by (1)
- a) A (1)
- b) B (1)
- 1.3 Describe the composition of the first generation (2)
- 1.4 Explain how these two dark mosquitoes evolved in the first generation (3)
- 1.5 Describe the composition of the survivors of the second pesticide application (2)

Differences between humans and African apes

Activity 4

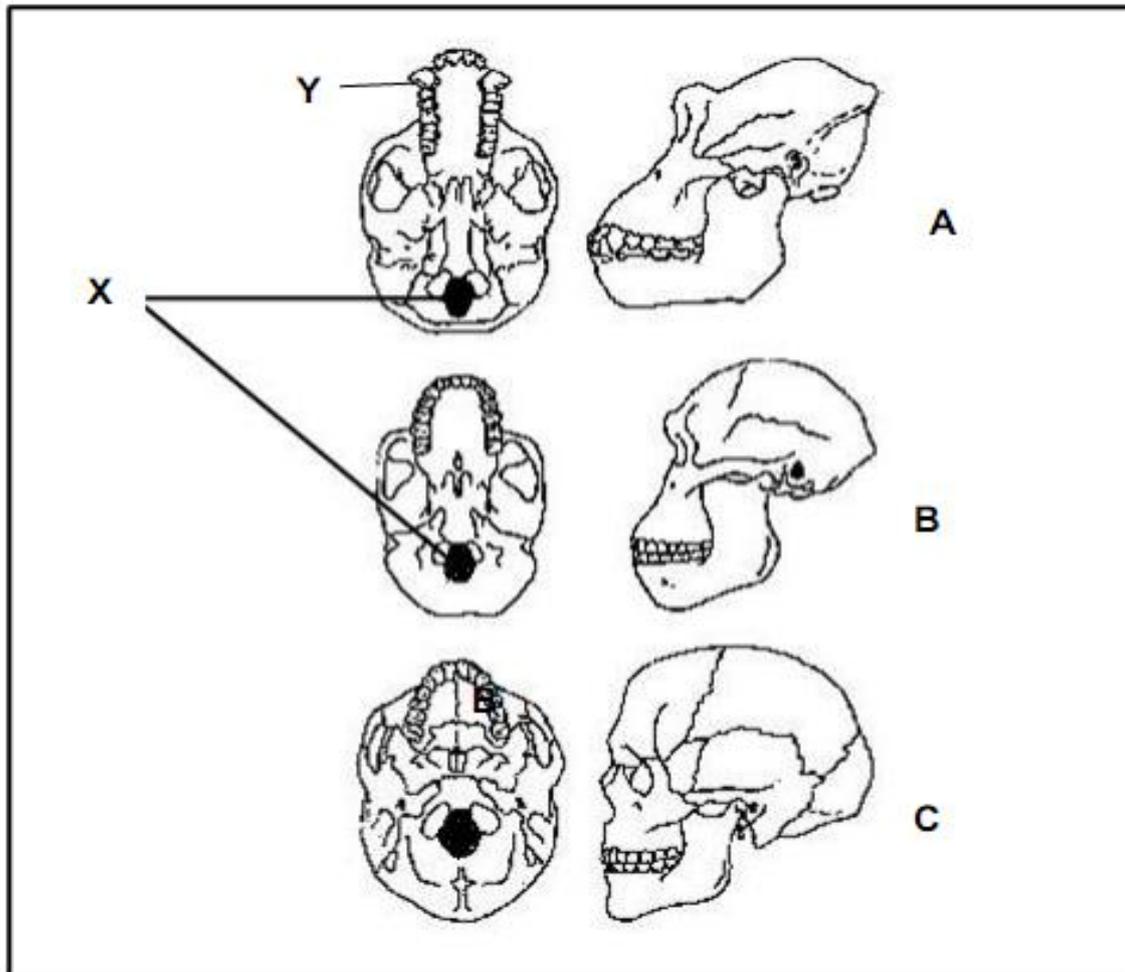
1 Parts of an African ape and a human skeletons



- 1.1.1 Give the label for **X** (1)
- 1.1.2 Describe the differences of the position of **X** in diagram **A** and **B** (2)
- 1.1.3 Explain the significations of the position of **X** in diagram **A** (4)
- 1.1.4 Tabulate THREE visible differences between the Jaw /Teeth of diagram **A** and diagram **B** (2)
- 1.1.5 Explain the difference in diagram **C** and **D**

2

Fossilised skulls of three different species of primates



2.1.1 Give the label for **X** and **Y** (1)

2.1.2 Which skull belongs to (2)

- a) Hominidae
- b) Hominin
- c) Bipedal

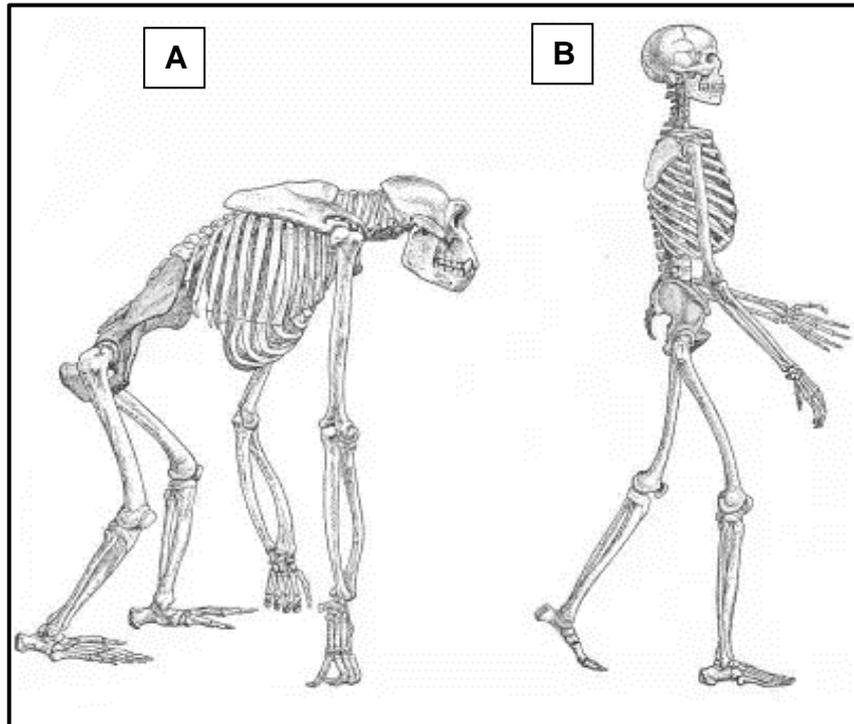
2.1.3 Explain how the change in the skull from **B** to **C** could indicate change in intelligence (4)

2.1.4 Tabulate FIVE visible differences between the skulls of **A** and **C** (2)

Similarities between humans and African apes

Activity 5

1 Skeletons of an African ape and a human



- 1.1. Organism **A** and **B** belong to the same order and family. Give the name of the order and family (1)
- 1.2. Give FOUR similarities they share regarding their **upper limbs** (4)
- 1.4. Which organism (1)
 - a) belong to the hominin group
 - b) Is quadrupedal
 - c) Is Mammalia
- 1.5. What is the different function of the opposable thumbs of organism **A** and **B** (2)
- 1.6. Give any other similarities that you did not mention in 1.2

PLANT HORMONES



**EXAMINATION
GUIDELINE**

PLANT HORMONES EXAMINATION GUIDELINE

CONTEN	ELABORATI
Plant hormones	<input type="checkbox"/> General functions of the following: <ul style="list-style-type: none"> • Auxins • Gibberellins • Absciscic acid <input type="checkbox"/> The control of weeds using plant hormones
Plant defence mechanisms	<input type="checkbox"/> Role of the following as plant defence mechanisms: <ul style="list-style-type: none"> • Chemicals



TERMINOLOGY

PLANT HORMONES TERMS

Terms	Explanation
Absciscic acid	Plant growth substance that is responsible for bringing about dormancy in seeds
Apical dominance	Inhibition of the growth of lateral buds by the auxins present in apical
Auxins	Plant growth substance that causes bending reactions in plant stems
Geotropism	Growth or bending reaction by plants in response to gravity
Gibberellins	Plant growth substance that is responsible for the elongation of internodes in plants
Hydrotropism	Growth or bending reaction by plants in response to water
Phototropism	Growth or bending reaction by plants in response to light
Tropism	Bending reaction of plants or parts of plants in response to an external

PLANT HORMONES

Plant hormones are organic compounds that occur in low concentrations and act as chemical messengers.

Hormones are synthesized in one part of the plant and transported to another part

AUXINS:

Mainly produced in the apical meristem of stems

Auxins move downward in the phloem, from the tip of the stem to cells lower down in the plant

Small amounts of auxins are produced in the growing tips of roots

Functions of Auxins:

Stimulate cell elongation

Stimulate development of fruit

Control abscission (cutting off) of leaves and fruit

Inhibit growth of lateral branches – apical dominance

Stimulates the development of adventitious roots in stem cuttings

Causes tropism in stems and roots

TYPES OF PLANT HORMONES AND THEIR FUNCTIONS

GIBBERELLINS:

Function of gibberellins:

Stimulate stem elongation

Stimulate root growth

Promote flowering

Promote the growth of lateral buds

Stimulate germination of seeds

ABSCISIC ACID:

Function of abscisic acid:

Causes dormancy of terminal buds and lateral buds in winter

Contributes to dormancy of seeds in inhibiting germination

Promotes abscission of leaves and fruit

Causes closing of stoma when plant wilts.

Phototropism is the growth movement of part of a plant in response to unilateral light stimulus

Stems and leaves grow towards the light to absorb maximum amount of sunlight for photosynthesis and are therefore positively phototropic

When the growing tip of a stem receives light unilaterally the light sensitive auxins move away from the light towards the shaded side

Auxins are produced at the tip of the stem from where they move downward evenly

The even distribution of auxins brings about equal growth on all sides of the stem

Therefore the stem grows straight upward



ROLE OF AUXINS IN PHOTOTROPISM

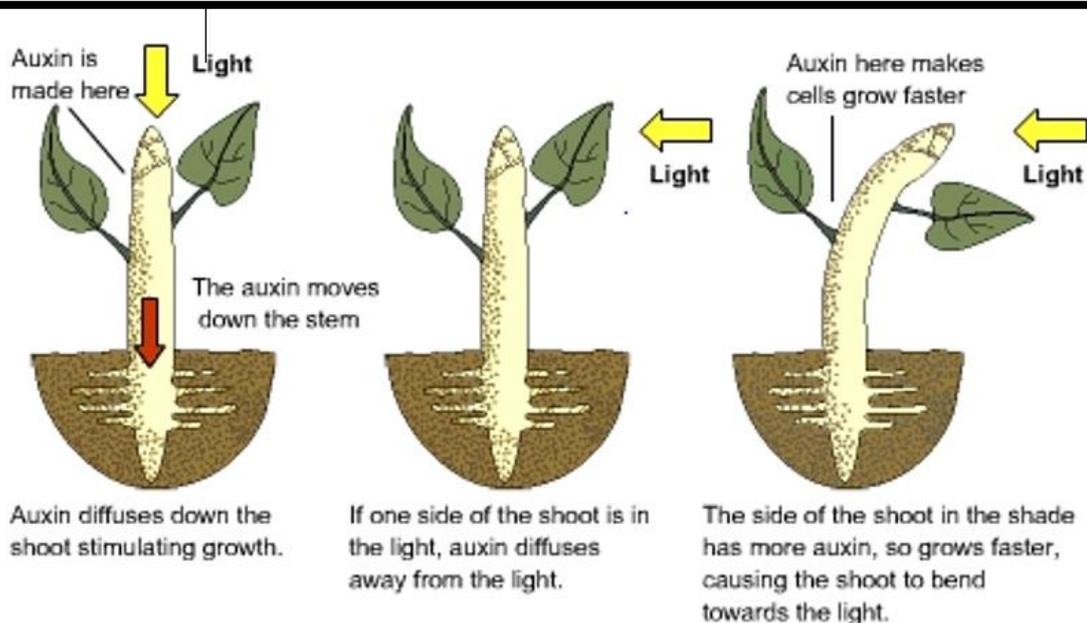


When stems are exposed to unilateral light (light from one side) the:

Brightly-lit side has a shortage of auxins because the auxins are destroyed by the light or because they move to the darker side.

A high concentration of auxins in stems promotes growth. Thus an uneven distribution of auxins causes uneven growth of the stem with the darker side growing faster

The stem bends toward the light i.e stems are positively phototropic



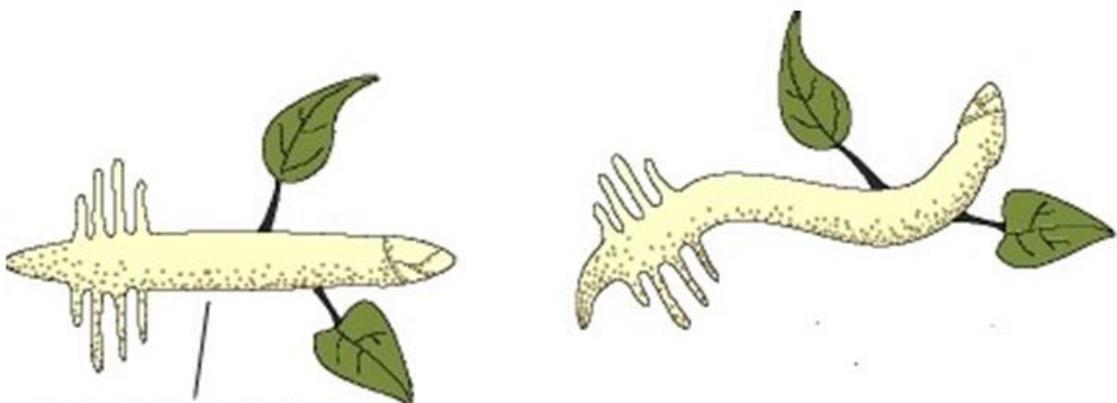
Geotropism is the growth movement of a plant part in response to unilateral gravitational stimulus
When a young seedling is placed horizontally the roots will eventually grow downward and the stem upwards.

Auxins are produced at the tip of the root from where they move upwards evenly
Auxins are produced at the tip of the stem from where they move downwards evenly
The even distribution of auxins brings about equal growth on all sides of the root and stem
Therefore, the root grows straight downward and stem upward

ROLE OF AUXINS IN GEOTROPISM

When a PLANT is placed horizontally:

- In the **ROOT** the auxins accumulate on the lower side because of gravity
- A high concentration of auxins on the lower side of root inhibits growth
- This uneven distribution of auxins causes uneven growth of the root with the upper side growing faster and the root bends downwards = *positively geotropic*
- In the **STEM** the auxins also accumulate on the lower side because of gravity
- A high concentration of auxins on the lower side of the stem stimulates growth
- This uneven distribution of auxins causes uneven growth of the stem with the lower side growing faster and the stem bends upward = *negatively geotropic*



If a plant is laid on its side, auxin gathers in the lower half of the stem and root

USE OF PLANT HORMONES IN AGRICULTURE:

Root formation in cuttings

Auxins stimulate development of adventitious roots

Cuttings develop bigger root systems by dipping them in auxin powder

In this way plants are cloned cheaply and quickly

Production of seedless fruit

Growth hormone are sprayed onto un-pollinated flowers, stimulating the development of the ovaries into fruit

No fertilization takes place, no seeds are formed and thus seedless fruit develop

Ripening of fruit

Some plant hormones are sprayed onto fruit to stimulate ripening so that all the fruit ripen at the same time and they can be harvested simultaneously

Prevention of premature abscission of fruit

High auxin concentrations prevent the formation of abscission layer in fruit stalks

Therefore spraying with auxins delays abscission

Harvesting dates can then be manipulated

Increase in fruit size

Grapes are often sprayed with gibberellins to increase the fruit size

Stimulation of germination

Gibberellins are sprayed on dormant seeds to interrupt dormancy and cause uniform germination

NB Weed control NB

Some herbicides contain high levels of auxins that accelerate the metabolism of broad leaved dicot weeds and therefore stimulate growth

These weeds grow so fast that their water absorption and food production are insufficient

The plant weaken and die

Farmers can therefore successfully destroy dicot weeds growing among narrow leaved monocot crops because the narrow leaved crops are not harmed by herbicides.

PLANT DEFENCE MECHANISMS:

Plants defend themselves by means of mechanical as well as chemical defense mechanisms:

APICAL DOMINANCE

High auxin concentration in the growing tip of the stem, inhibits the development of lateral buds close to the growing tip

As auxin concentration lowers further away from growing tip, lateral buds develop into lateral branches

Significance of this is that plants compete with each other to grow as tall as possible for maximum absorption of sunlight

If growing tip is severed the auxin concentration will decrease and lateral buds closer to the tip will no longer be inhibited and will develop into lateral branches

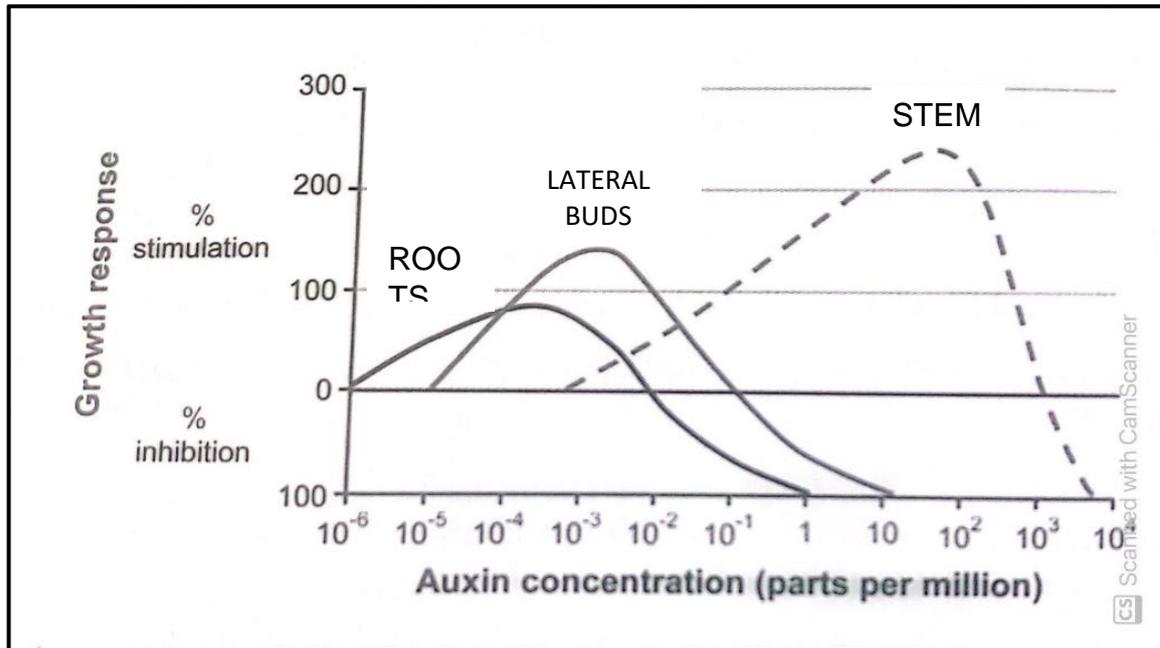
PLANT HORMONES: The functions of the different plant hormones

Activity 6

AUXINS	GIBBERELLINS	ABSCISIC ACID

1. Define *plant hormone*. (3)
2. "High doses of plant hormones can kill weeds" Explain what is meant by this statement. (3)
3. Complete the table below to indicate the functions of the plant hormones (21)

4. Study the graphic representation below showing the effect of auxin on the growth of lateral buds, stems and roots and answer the questions that follow.



- 4.1 What can you conclude about auxin concentration and root development? (2)
- 4.2 What can you conclude about auxin concentration (up to and including 10 parts per million) and cell elongation in stems? (2)
- 4.3 What effect does the increase in auxin have on the growth of lateral buds? (1)
- 4.4 Which term is used for the effect mentioned in QUESTION 4.3 (1)
- 4.5 Which ONE of the following is most stimulated by an increased auxin concentration?
Lateral buds, stems or roots? (1)
- 4.6 At which auxin concentration:
 - 4.6.1 Did the growth of lateral buds begin to decrease (1)
 - 4.6.2 Is root development completely inhibited (1)

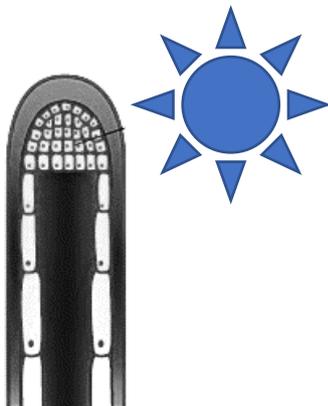
PLANT HORMONES: The role of auxins in tropisms

Activity 7

1. Complete the following diagram.

Name the hormone responsible for tropisms. (1)

Where does this hormone work? (2)



Which way will this shoot grow? Give a reason for your answer. (2)

What is positive phototropism? (2)

What is negative phototropism? (2)

What is positive geotropism? (2)

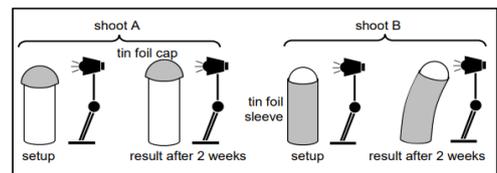
What is negative geotropism? (2)

Charles Darwin investigated tropism in plants. Students did a similar investigation than Darwin.

The students used the following method.

Two shoots, labelled shoot A and shoot B were used. Both shoots were from the same plant species. The tip of shoot A was covered with a tin foil cap. The sides of shoot B were covered with a tin foil sleeve. Both shoots were exposed to unilateral light using two lamps. The lamps were placed at the same distance from the shoots. The apparatus was left for 2 weeks. After 2 weeks, she observed what happened to shoot A and B.

The diagram shows how the investigation was set up.



Identify the:

(a) Independent variable

(1)

(b) Dependent variable

(1)

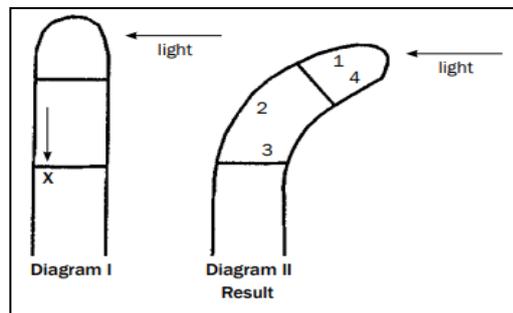
State 3 planning steps that the students considered in this investigation. (3)

Explain the results observed with shoot B. (4)

How did the students ensure the validity of this investigation? (4)

State 3 ways in which the reliability of the investigation can be improved. (3)

2. The following questions are based on diagram I and II.



2.1 Which stimulus are the two diagrams responding to?

2.2 The curving of the shoot in diagram II is due to more rapid cell growth in region(s)...

- A 1
- B 2
- C 1 and 4
- D 3 and 4

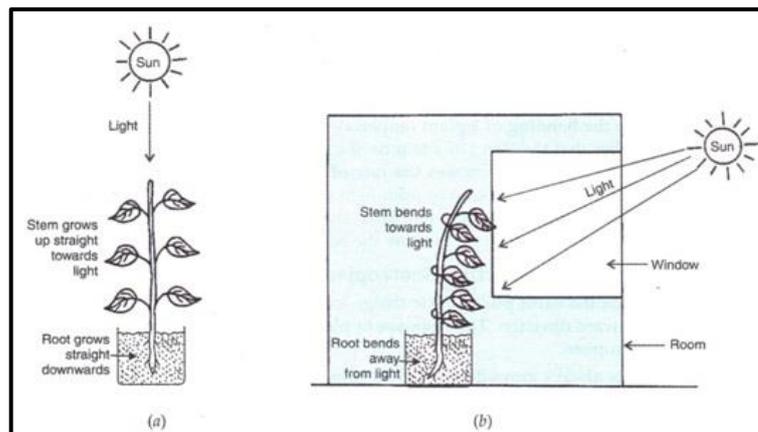
(2)

2.3 The diagrams above represent...

- A geotropism.
- B apical dominance.
- C phototropism.
- D gravity.

(2)

3. Study the diagram below:



3.1 Give a suitable aim for the investigation

(2)

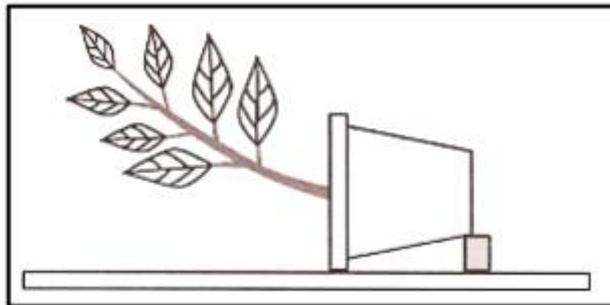
3.2 Mention the:

(a) Dependent variable

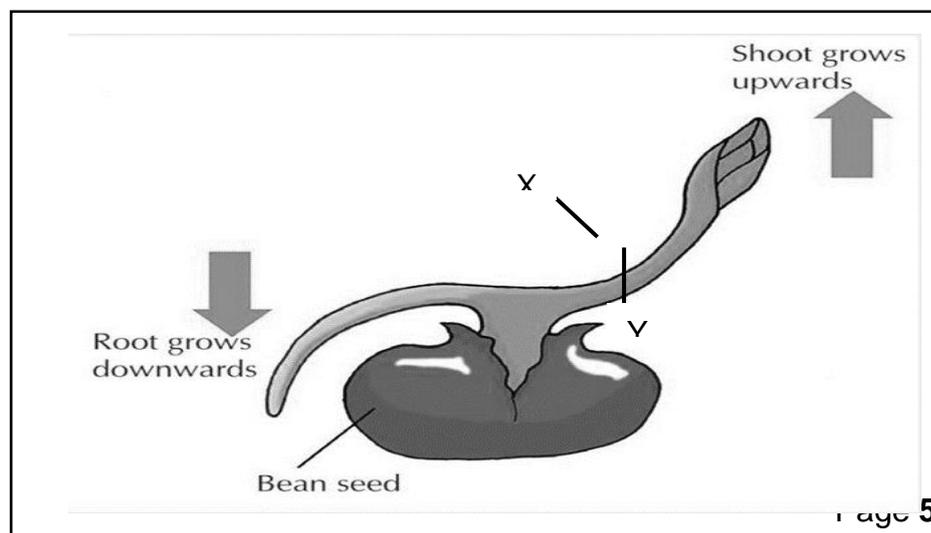
(1)

(1)

- (b) Independent variable (4)
- (c) List the variable that must be kept constant (4)
- 3.3 Tabulate the results of the investigation (3)
- 3.4 Which plant is the control (A or B) ? Explain your response. (2)
- 3.5 Why is it necessary to have a control? (2)
- 3.6 Explain why it is important for stems to grow upwards towards light and away from gravity. (2)
- 3.7 State ways in which this investigation could be improved (3)
4. The pot plant in the diagram below was placed onto its side in a dark cupboard. After 2 weeks, the stem had started to grow upwards.



- 4.1 What is the term used to describe this phenomenon? (1)
- 4.2 Define the phenomenon identified in QUESTION 4.1 (3)
- 4.3 Discuss the role of auxins in the phenomenon mentioned in QUESTION 4.1 in respect to the roots of the plant. (2)
5. The following diagram shows a germinating bean seed pinned horizontally on moist cotton wool. After a few days the shoot (young stem) starts growing upwards.



- 5.1 Which plant hormone is responsible for this phenomenon? (1)
- 5.2 On which side (X OR Y) will the concentration of this hormone be greater? (1)
- 5.3 Explain how this hormone affects the growth of the root. (1)
- 5.4 What stimulus or stimuli will affect the growth of the root? (1)

6. A group of grade 12 learners investigated the relationship between temperature and geotropism. In each case six seedlings were germinated and orientated with the radicles in the horizontal position. They were exposed to two different temperatures. After one week the root angles were measured and recorded in the table below.

Seedling	Root angle at 20°C (in degrees)	Root angle at 30°C (in degrees)
1	140	138
2	133	137
3	135	140
4	130	145
5	126	142
6	146	150
Average	135	142

- 6.1 Write down a suitable caption for the table. (1)
- 6.2 Why was the average calculated? (2)
- 6.3 Draw **two** sets of bar graphs on the same system of axes to represent the results as shown in the table above. (6)

PLANT HORMONES

Activity 8

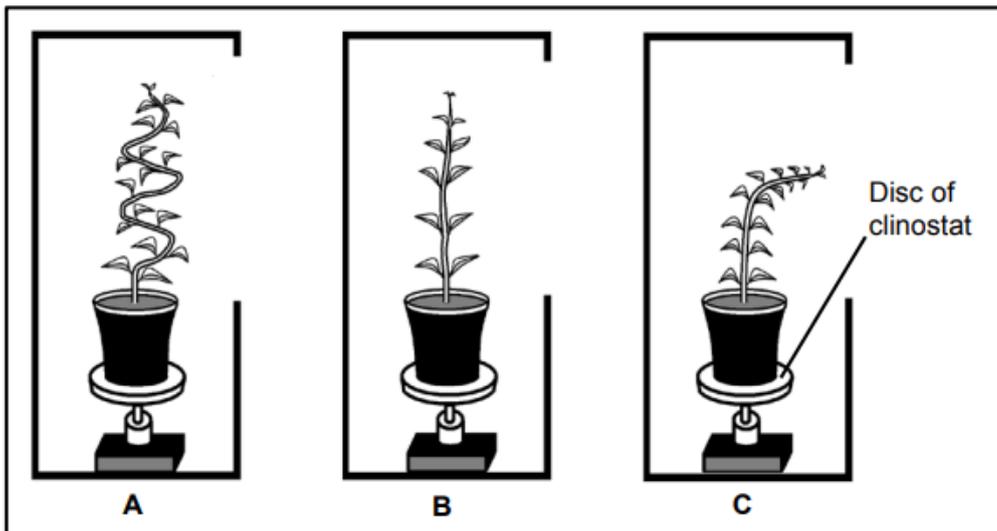
- *Design investigations to show geotropism and phototropism*
- *Identify the variables and recommend ways to control the variables*
- *Record and interpret the results*

QUESTION 1

1.1 A clinostat is a device used to investigate plant growth responses. It has a disc that rotates very slowly when the clinostat is switched on. During an investigation on plant responses to light, the procedure below was followed:

- Three pot plants of the same species were used
- Each pot plant was placed on one of three identical clinostats
- Each set of apparatus, A, B and C, was placed in a box with a single opening
- Each clinostat was treated in a different way over a period of five weeks.

The results of the investigation are represented in the diagrams below



- 1.1.1 Name the plant growth response to light. (1)
- 1.1.2 State TWO factors that were kept constant during the investigation. (2)
- 1.1.3 Give ONE reason why the results of this investigation may be considered to be unreliable. (1)
- 1.1.4 In which apparatus (A, B or C) was the clinostat:
(a) Switched on and rotating slowly (1)

(b) Switched off (1)

(c) Switched off, but manually rotated through 180° once a week (1)

1.1.5 Explain the effect of the unilateral light on the distribution of auxins in the plant in apparatus C. (3)

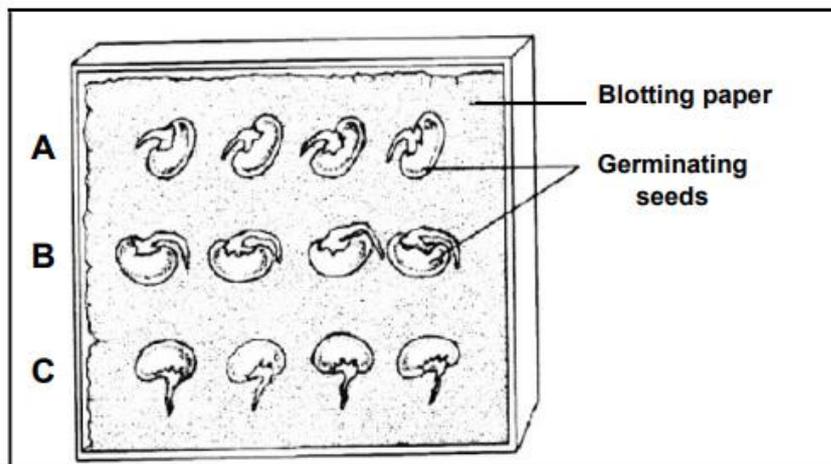
QUESTION 2

2.1 An investigation was conducted to determine the effect of gravity on the direction of root growth in germinating seeds.

The procedure was as follows:

- A glass jar was lined with a layer of thick blotting paper
- 12 germinating bean seeds were placed between the glass jar and the blotting paper as follows:
 - A: 4 seedlings with their root tips pointing horizontal
 - B: 4 seedlings with their root tips pointing upwards
 - C: 4 seedlings with their root tips pointing downwards
- The glass jar received light from all directions
- The growth response of the root tips was observed

The diagram below shows the observation made after a week.



2.1.1 In this investigation, identify the:

(a) Independent variable (1)

(b) Dependent variable (1)

2.1.2 Mention TWO ways in which the validity of the investigation could have been improved. (2)

2.1.3 Give the name of the growth in response to gravity as observed in this investigation. (1)

2.1.4 Why did the investigator use 4 bean seeds for each group? (1)

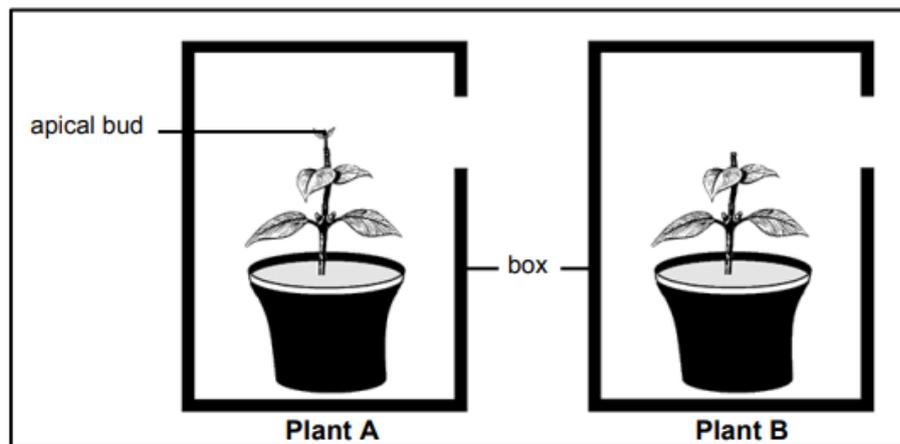
2.1.5 Explain the results of the investigation as observed in group **A**. (5)

QUESTION 3

3.1 The diagram below shows two plants (**A and B**) at the start of an investigation.

The plants were treated in the following ways:

- No changes were made to plant **A**
- The apical bud of plant **B** was removed
- Each plant was covered with a box with a single opening and placed in a lit room.



3.1.1 State the role of the boxes in the investigation. (1)

3.1.2 Name the hormone that is removed by cutting off the apical bud from plant **B**. (1)

3.1.3 Tabulate TWO differences between plants **A** and **B** you would expect after two weeks. (5)

3.2 In another investigation the diagram below shows plant **B** seven days after being sprayed with gibberellins



- 3.2.1 State the aim for this second investigation. (2)
- 3.2.2 Formulate a conclusion for this investigation. (2)
- 3.2.3 Refer to the changes observed in the diagram and explain your answer to QUESTION 3.2.2 (2)



PROTEIN SYNTHESIS

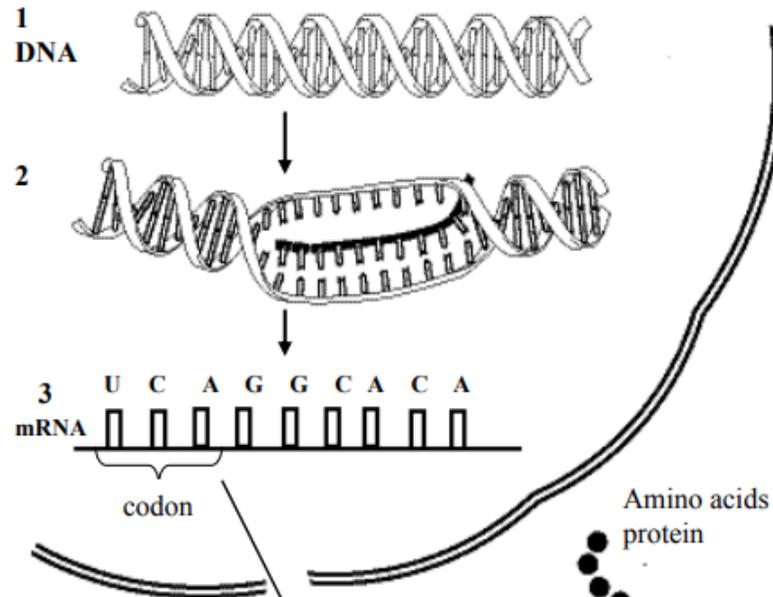
PROTEIN SYNTHESIS EXAMINATION GUIDELINES

CONTEN	ELABORATIO
Protein synthesis	<ul style="list-style-type: none">□ The involvement of DNA and RNA in protein synthesis:<ul style="list-style-type: none">• Transcription<ul style="list-style-type: none">○ The double helix DNA unwinds.○ The double-stranded DNA unzips/weak hydrogen bonds break to form two separate strands.○ One strand is used as a template○ to form mRNA○ using free RNA nucleotides from the nucleoplasm.○ The mRNA is complementary to the DNA.○ mRNA now has the coded message for protein synthesis.• mRNA moves from the nucleus to the cytoplasm and attaches to the ribosome.• Translation<ul style="list-style-type: none">○ Each tRNA carries a specific amino acid.○ When the anticodon on the tRNA○ matches the codon on the mRNA○ then tRNA brings the required amino acid to the ribosome.○ (Names of specific codons, anticodons and their amino acids are not to be memorised.)○ Amino acids become attached to each other by peptide bonds○ to form the required protein. □ Simple diagram to illustrate transcription and translation in protein synthesis

IN THE NUCLEUS

PROCESS OF PROTEIN SYNTHESIS

TRANSCRIPTION

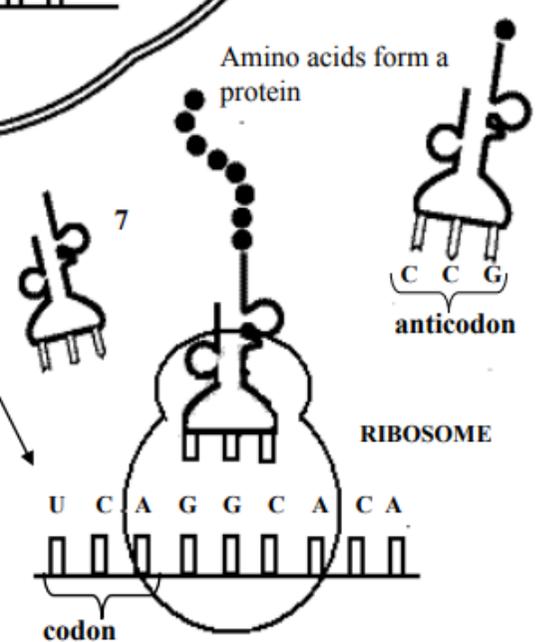


TRANSCRIPTION

1. DNA unwinds and splits
2. One DNA strand acts as template for forming mRNA
3. Free nucleotides arrange to form mRNA according to the DNA template
4. mRNA is complementary to the DNA template i.e. A-U and C-G
5. This is called **TRANSCRIPTION**

TRANSLATION

6. mRNA moves through the nuclear pore into the cytoplasm and wrap around the ribosome
7. Each tRNA brings a specific amino acid to the ribosome
8. Amino acids are arranged in a specific order according to the CODONS on the mRNA
9. The amino acids are linked together to form a particular protein
10. This process is called **TRANSLATION**
11. The entire process is controlled by enzymes



IN THE CYTOPLASM

TRANSLATION

NB: REMEMBER ORDER

DNA
mRNA.....codon
tRNA.....anticodon
amino acid.....

EXAMPLE

DNA CAT
mRNA... GUA codon
tRNA..... CAU anticodon
amino acid CAU

TRANSCRIPTION:

1. The double helix DNA molecule unwinds
2. The double-stranded DNA unzips/ weak hydrogen bonds break to form two separate strands
3. One strand is used as a template
4. To form mRNA
5. Using free RNA nucleotides from the nucleoplasm
6. The mRNA is complementary to the DNA
7. mRNA now has the coded message for protein synthesis
8. mRNA moves from the nucleus to the cytoplasm and attach to the ribosome

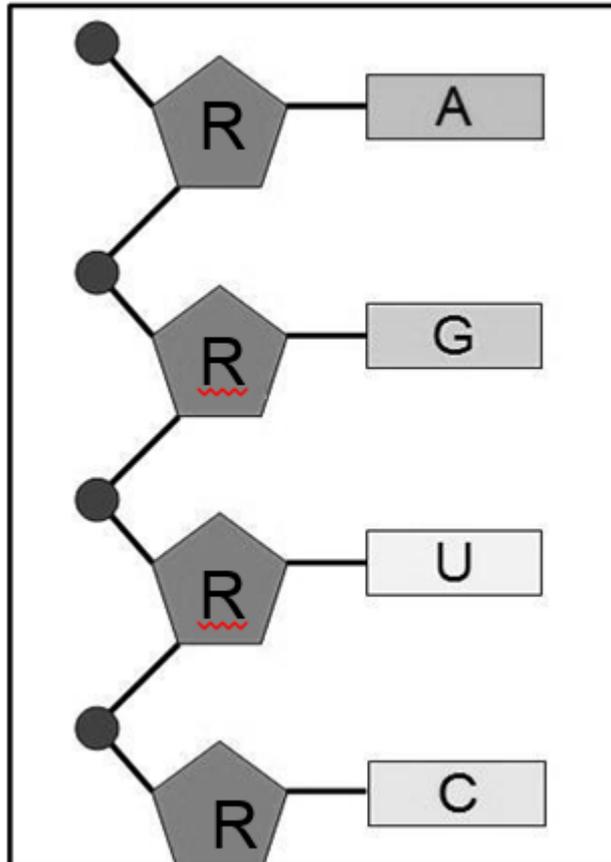
TRANSLATION:

1. Each tRNA carries a specific amino acid
2. When the anticodon on the tRNA
3. Matches the codon on the mRNA
4. Then tRNA brings the required amino acid to the ribosome
5. Amino acids become attached to each other by peptide bonds
6. To form the required protein

Protein synthesis

Activity 9

Study the diagram below and answer the questions that follow



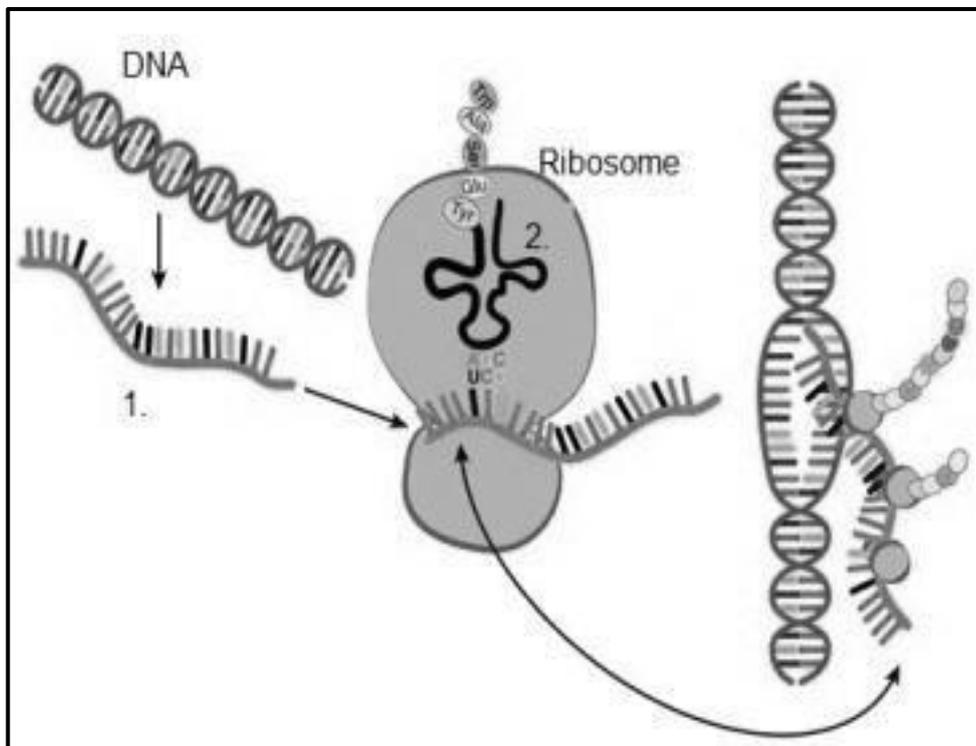
- 1.1 Give THREE reasons why this is an RNA molecule. (3)
- 1.2 Draw a labelled diagram of the third nucleotide as indicated in the above diagram (3)
- 1.3 Which nitrogenous base from DNA is being replaced by uracil in RNA? (1)

QUESTION 2

- 2.1 The diagram below shows two types of RNA found in a cell.

Draw the diagram and complete the table.

(6)



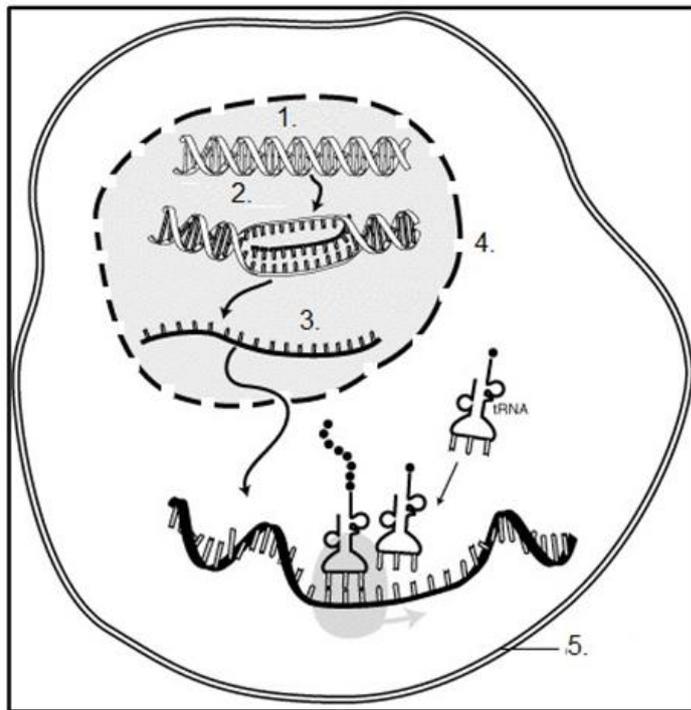
	Number 1	Number 2
Type of RNA		
Position in cell		
Function		

2.2 Draw a stick diagram of number 1 and 2. (4)

2.3 What is the main function of RNA in a cell? (1)

QUESTION 3

Study the diagram of an RNA molecule below and answer the questions that follow.

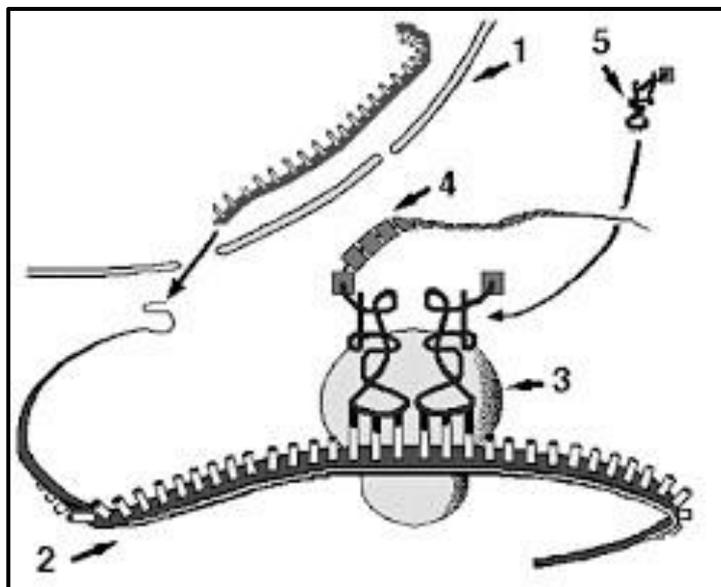


- 3.1 Identify molecule 1 and 3. (2)
- 3.2 Which process is taking place at number 2?
Why does this process take place? (2)
- 3.3 Give the NAME and the NUMBER of the organelle mentioned in QUESTION 3.2 where the process takes place. (2)
- 3.4 Briefly describe the above process. (6)
- 3.5 Draw the following table and complete the differences between DNA replication and the process mentioned in QUESTION 3.2. (6)

	DNA Replication	Transcription
Template		
Product		
Nucleotides		
Nitrogenous base pairs that are formed		

QUESTION 4

Study the diagram below and answer the questions that follow:



-
- 4.1 Identify the process above. Where does this process take place 2
- 4.2 Which organelle is represented by number 3? Give the function of this organelle. 2
- 4.3 Identify the labels numbered 4 and 5 respectively. Explain the relationship between these two structures. 4

- 5.2 Indicate whether each of the descriptions in COLUMN I apply to A ONLY, B ONLY, BOTH A AND B or NONE of the items in COLUMN II. Write A only, B only, both A and B or none next to the question numbers (5.2.1 to 5.2.5) in the ANSWER BOOK.
(5 x 2)

COLUMN A		COLUMN B	
5.2.1	mRNA is synthesized during ...	A:	Transcription
		B:	Translation
5.2.2	tRNA	A:	Codon
		B:	Anticodon
5.2.3	One amino acid is equal to this number of codons.	A:	ONE
		B:	THREE
5.2.4	tRNA carries the amino acids to the	A:	Ribosome
		B:	Nucleus
5.2.5	A polypeptide is a sequence of	A:	Amino acids
		B:	Proteins

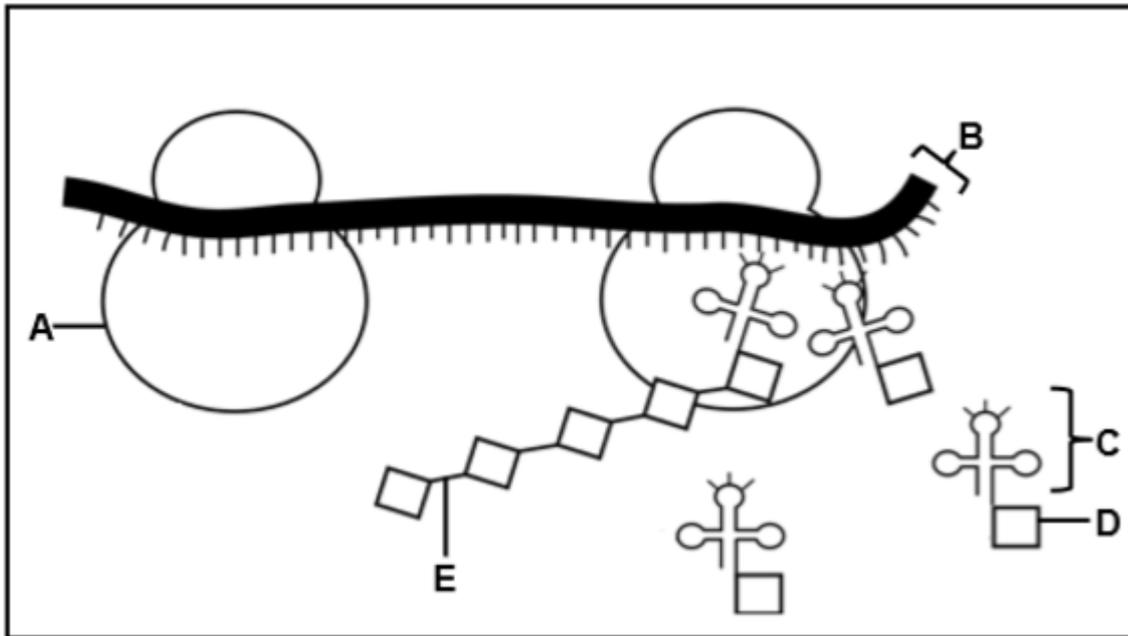
QUESTION 6

- 6.1 Tabulate the structural differences between DNA and RNA. (7)
- 6.2 Name TWO similarities between DNA and RNA. (2)

Protein synthesis

Activity 10

The diagram below represents the process of protein synthesis:

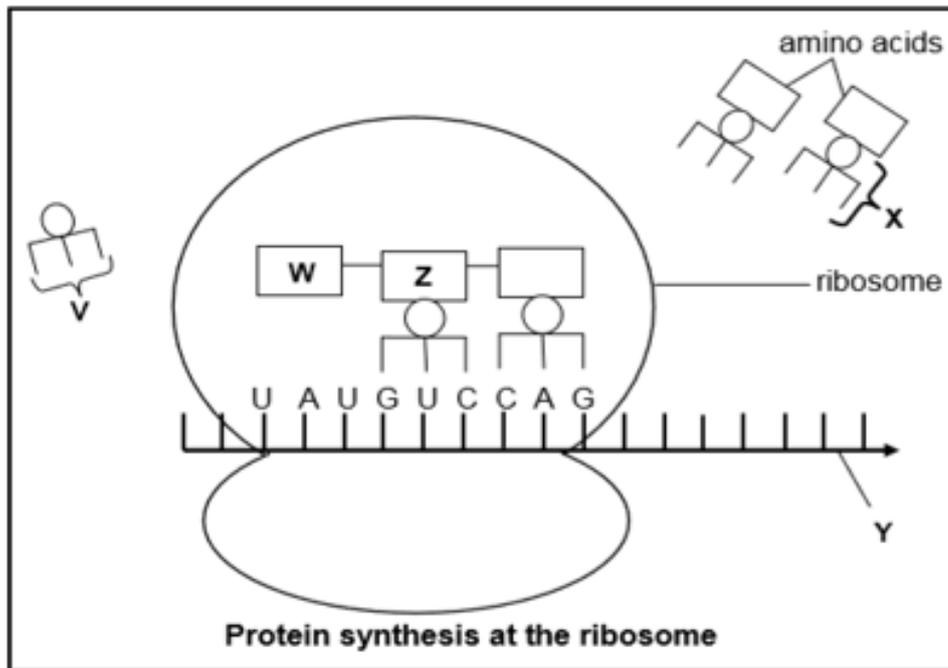


- 1.1 Identify the process above (1)
- 1.2 Identify
 - (a) Organelle A (1)
 - (b) Molecule B (1)
 - (c) The bond at E (1)
- 1.3 Give only the LETTER of the molecule that
 - (a) Carries the amino acid (1)
 - (b) Is copied from DNA (1)
 - (c) Is the monomer of proteins (1)

Protein synthesis

Activity 11

Study the diagram below which shows a part of the process of protein synthesis



- 1 Identify the stage of protein synthesis that is shown in the diagram above (1)
- 2 Identify molecules X and Y (2)
- 3 State the term for the group of three nitrogenous bases indicated by V (1)
- 4 Give the nitrogenous bases on the DNA strand that codes for the bases UAU on molecule Y (1)

HOMEOSTASIS

HOMEOSTASIS EXAMINATION GUIDELINES

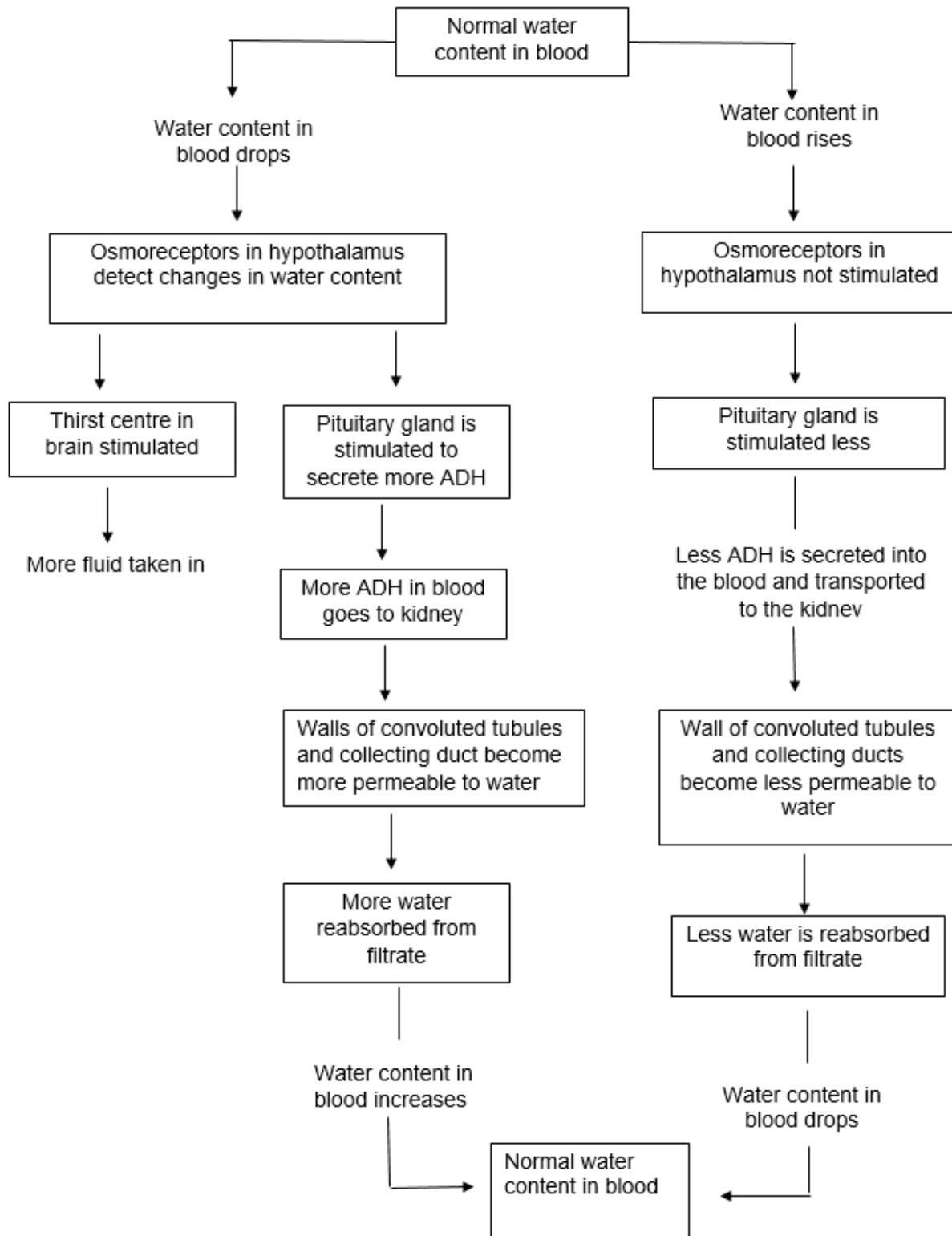


EXAMINATION GUIDELINE

CONTEN	ELABORATI
Introduction – Homeostasis	<ul style="list-style-type: none"> □ Homeostasis as the process of maintaining a constant, internal environment within narrow limits, despite changes that take place internally and externally. □ The conditions within cells depend on the conditions within the internal environment (the tissue fluid)
Homeostasis: Negative feedback mechanisms	<ul style="list-style-type: none"> □ Negative feedback mechanism controlling each of the following in the body: <ul style="list-style-type: none"> • Thyroxin levels • Blood glucose levels • Blood carbon dioxide levels • Water balance (osmoregulation) • Salt □ Disorders caused by an imbalance in levels of: <ul style="list-style-type: none"> • Thyroxin – Goitre • Blood glucose – Diabetes mellitus

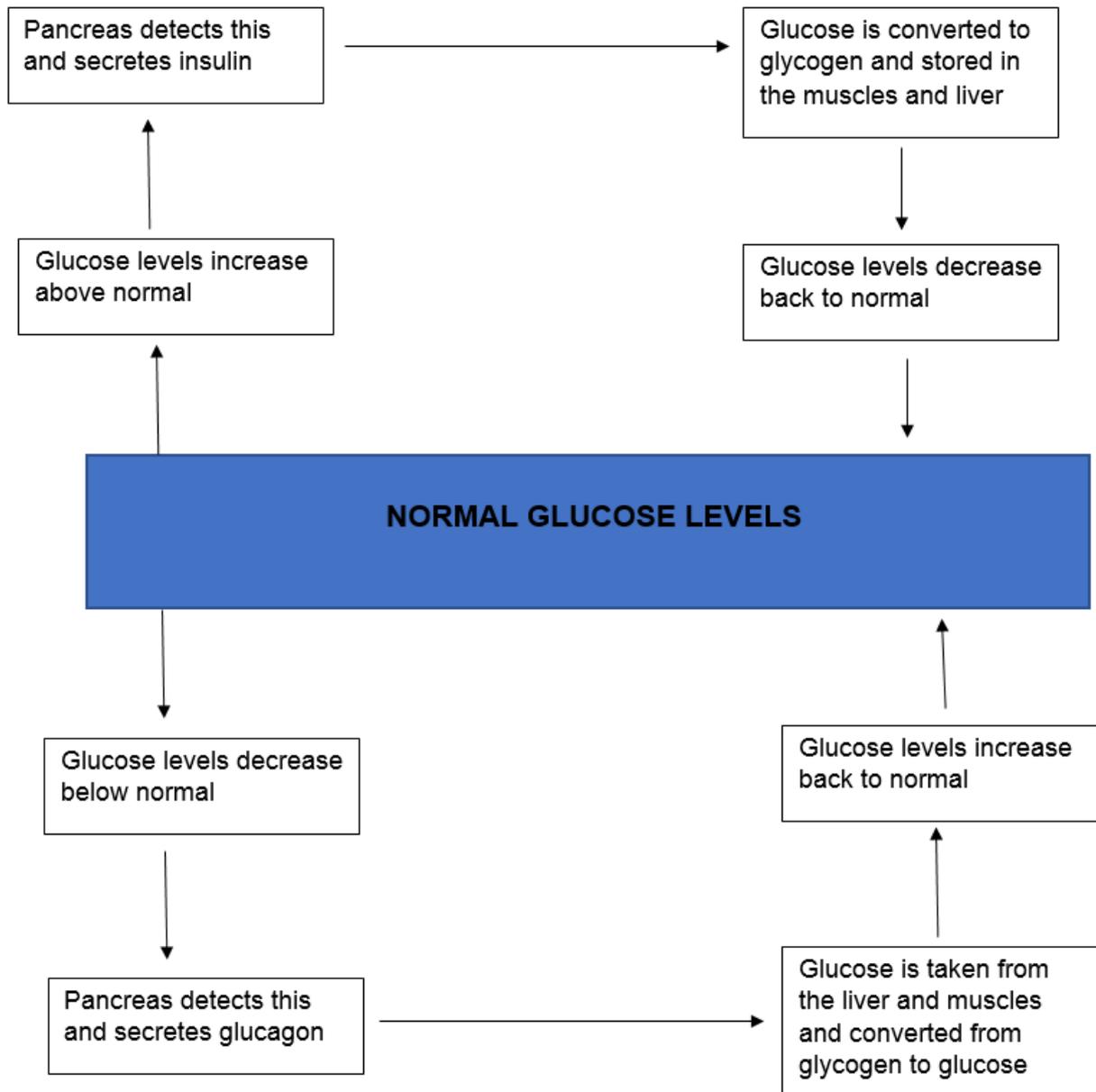
CONTEN	ELABORATI
Homeostasis: Negative feedback mechanisms (... continued)	<ul style="list-style-type: none"> □ Thermoregulation <ul style="list-style-type: none"> • Structure of the skin, using a diagram, with an emphasis on the parts involved in thermoregulation □ Role of the following in negative feedback mechanism for controlling temperature/thermoregulation: <ul style="list-style-type: none"> • Sweating • Vasodilation • Vasoconstriction

REGULATION OF WATER

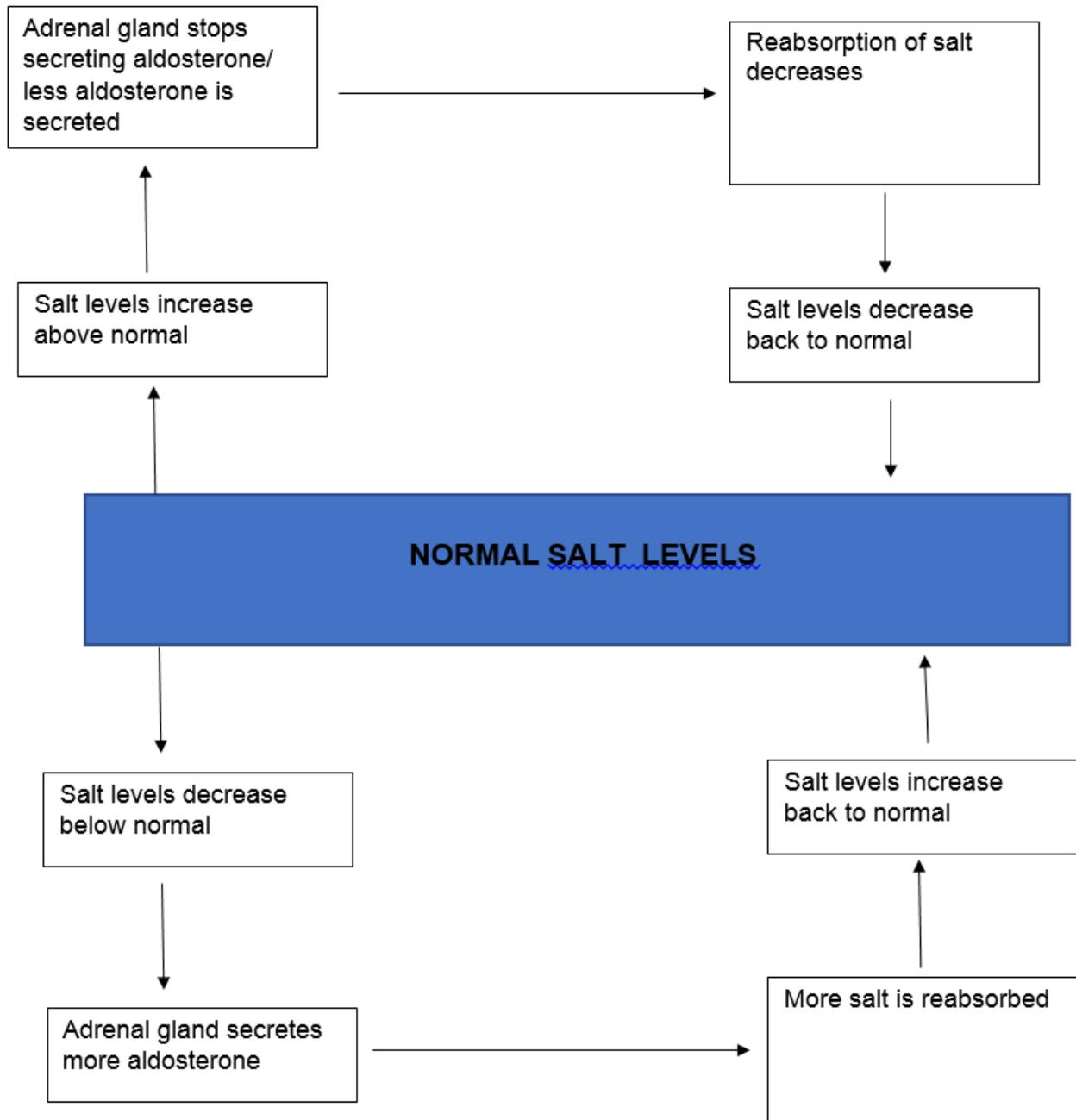


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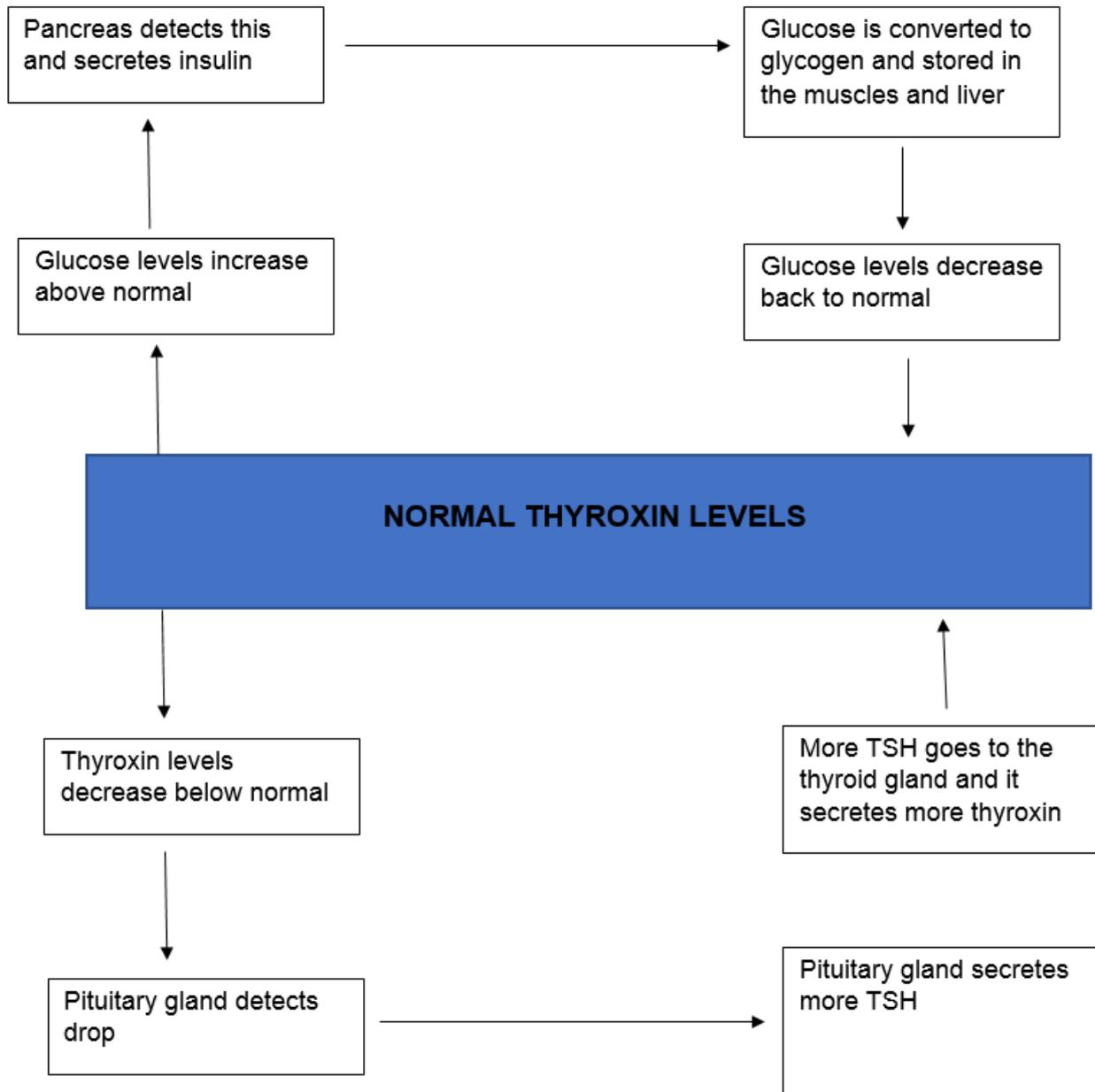
REGULATION OF GLUCOSE



REGULATION OF SALT

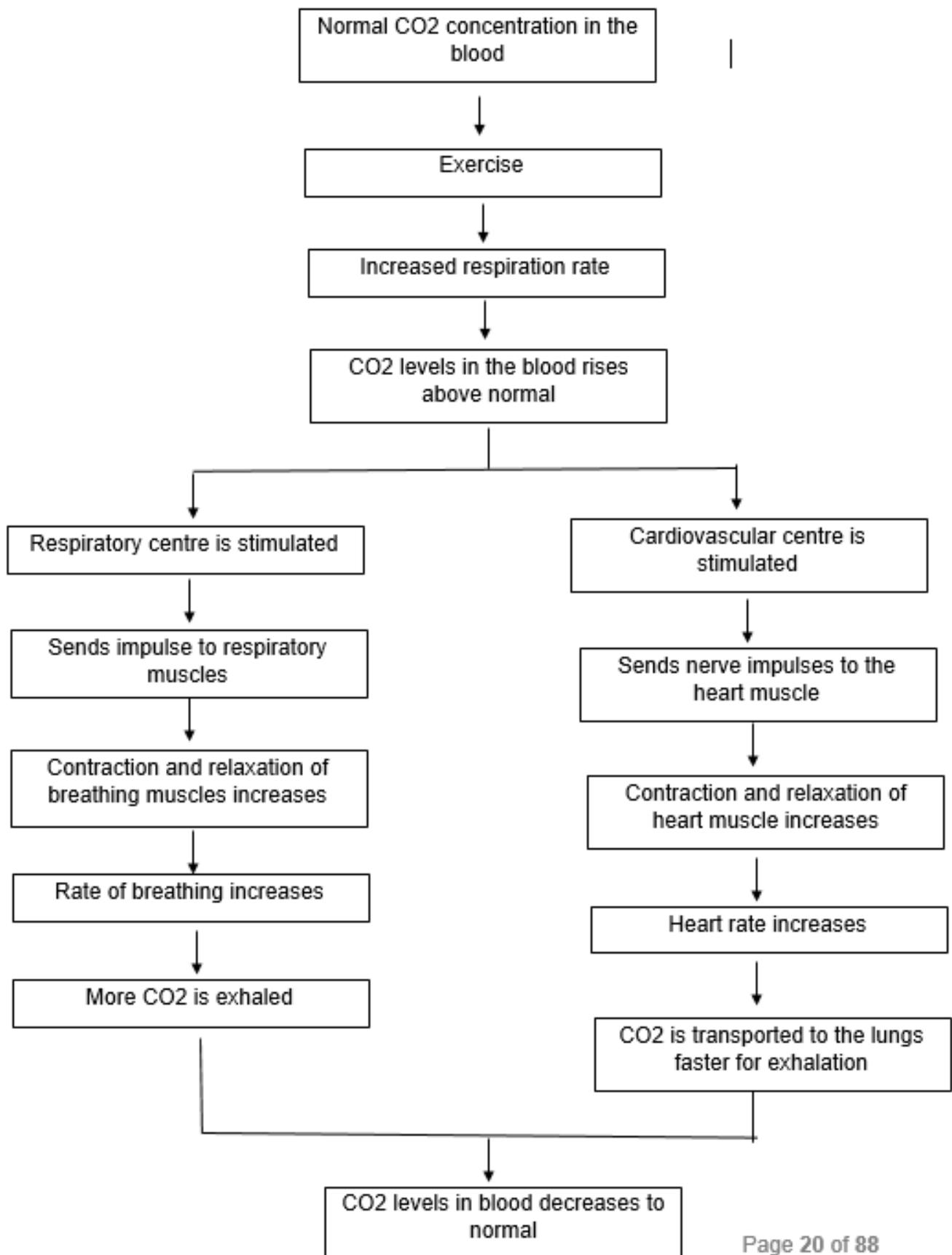


REGULATION OF THYROXIN

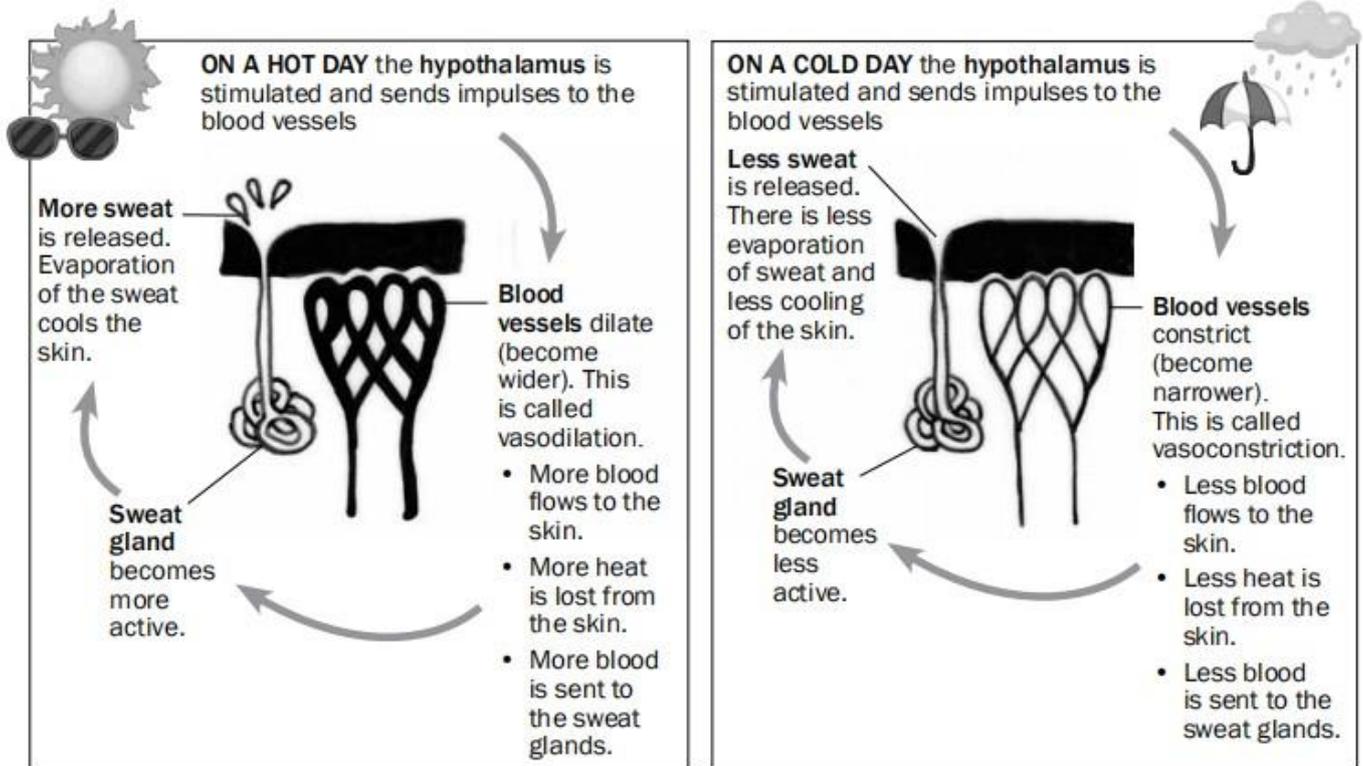


REGULATION OF CARBON DIOXIDE

CARBON DIOXIDE LEVELS



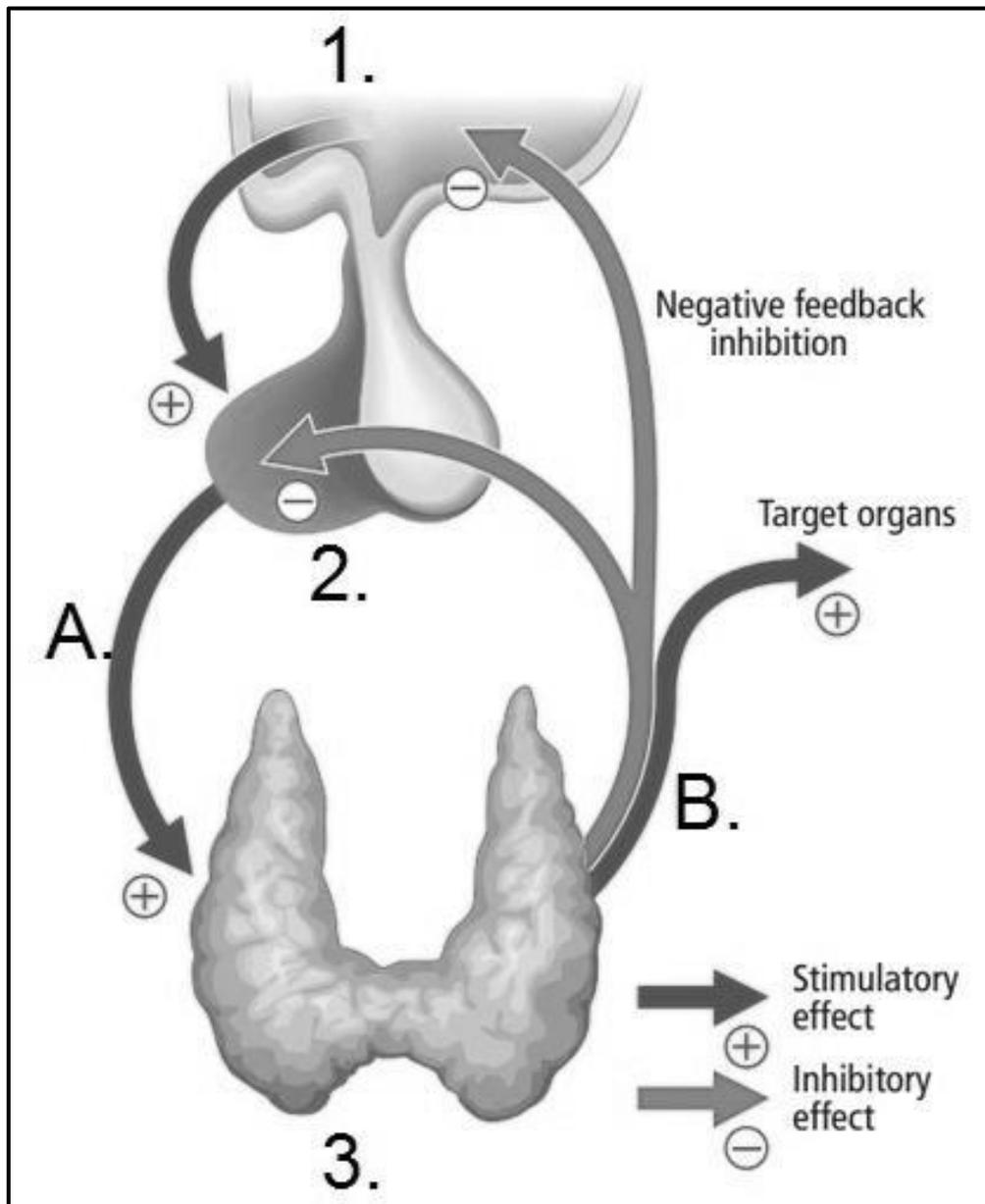
THERMOREGULATION



Homeostasis

Activity 12

1. Study the diagrams below



- 1.1 Define negative feedback. (2)
- 1.2 Why is negative feedback important in the human body? (3)
- 1.3 Name glands 1,2 and 3. (3)

2. Use the diagram above and complete the table below indicating the different levels of thyroxin

	LOW THYROXIN LEVEL	HIGH THRYOXIN LEVEL
1.		
2.		
3.		
4.		
5.		
6.		
7.		

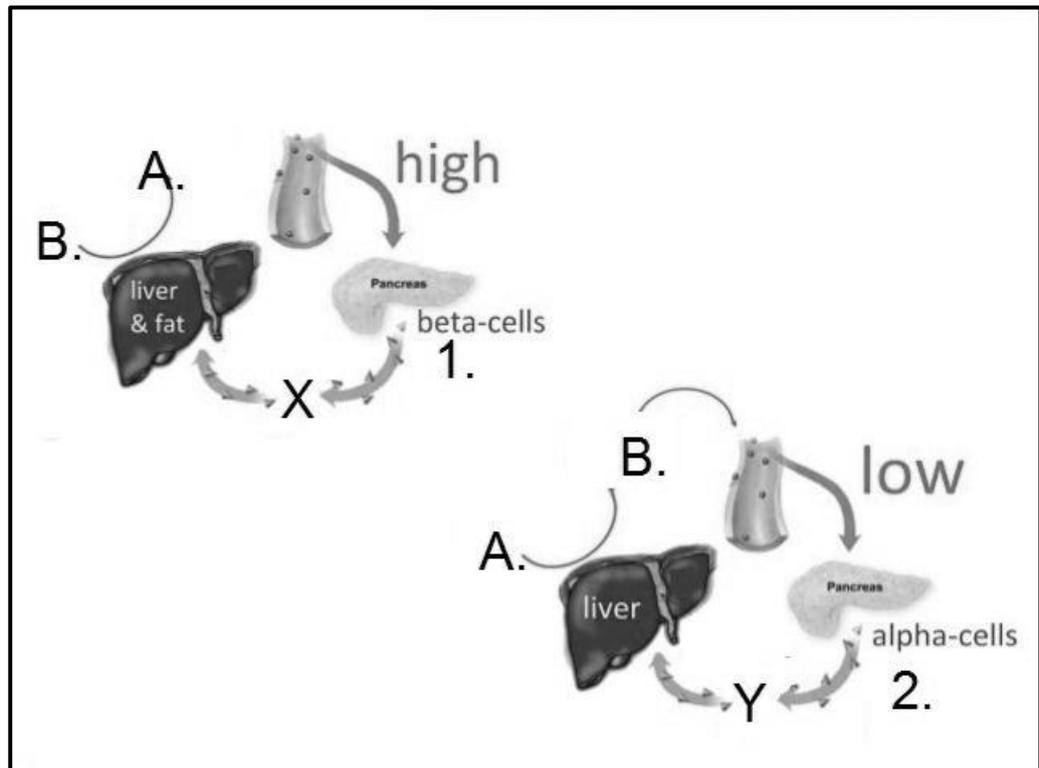
(14)

Total (22)

Homeostasis

Activity 13

1. Answer the following questions
 - 1.1 Define diabetes mellitus (2)
 - 1.2 Differentiate between diabetes 1 and 2. (6)
 - 1.3 Discuss treatment for diabetes (4)
2. Use the diagram below.



- 2.1 Name HORMONES X and Y (2)
- 2.2 Identify molecules A and B. (2)
- 2.3 By using the numbers and letters in the above diagram complete the following table. (14)

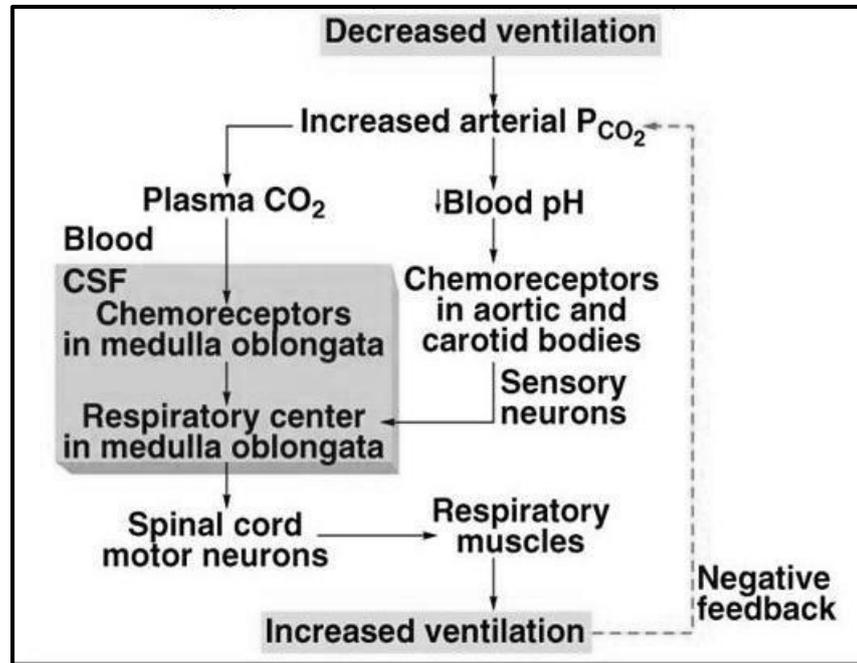
	HIGH GLUCOSE LEVEL	LOW GLUCOSE LEVEL
1.		
2.		
3.		
4.		
5.		
6.		
7.		

Tota(30)

Homeostasis

Activity 14

1. Study the diagram



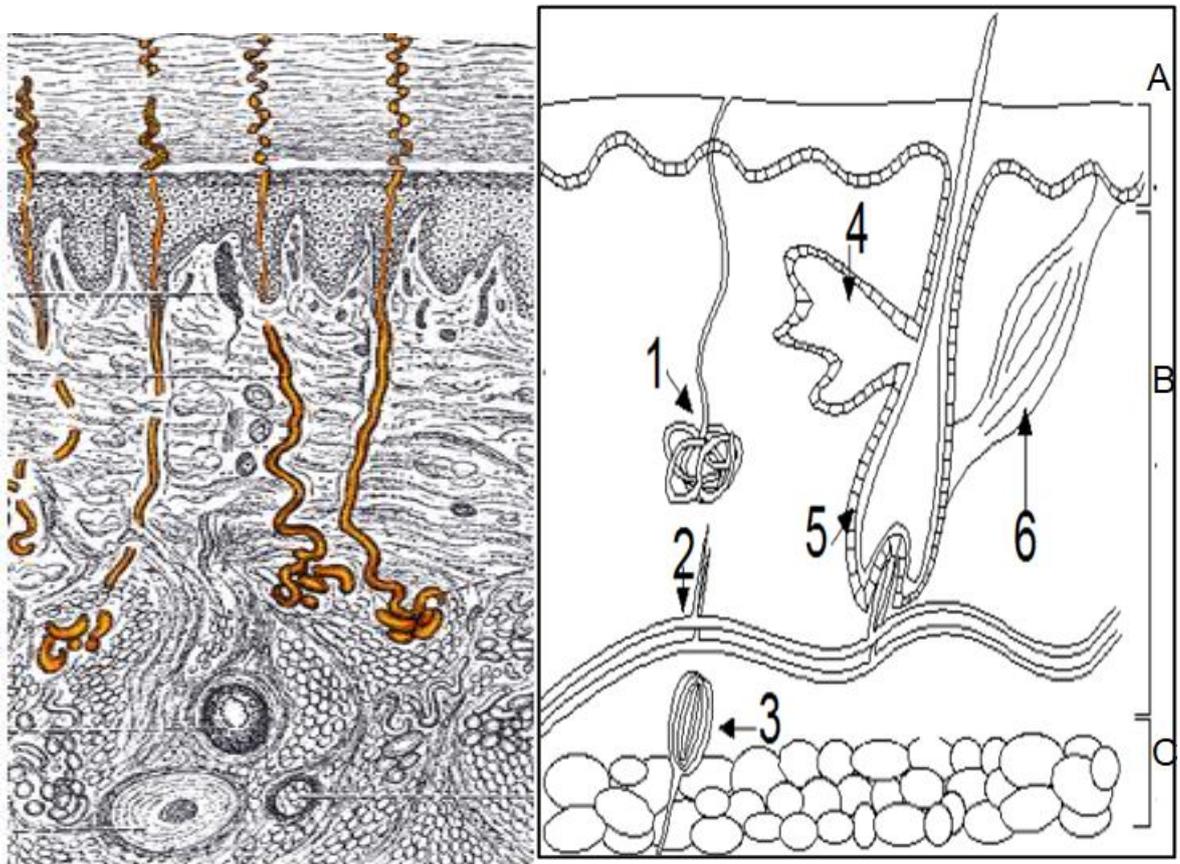
- 1.1 Use the information in the diagram and explain in your words negative feedback of CO₂ (14)

Total 14

Homeostasis

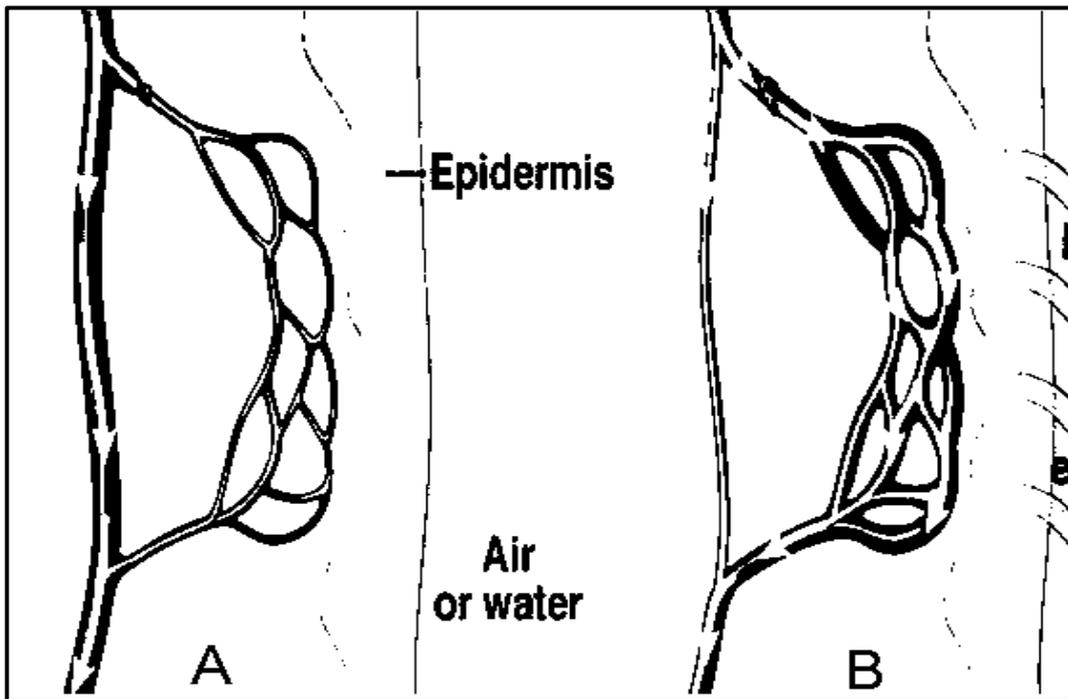
Activity 15

1. Define homeostasis. (2)
2. Name SIX important matters in our bodies that must be kept constant (6)
3. Study the diagram and answer the questions.



- 3.1 Label the micrograph with the same symbols and numbers of the diagram. Wrote down the correct labels of the two diagrams. 13
- 3.2 Describe how the skin is adapted for homeostatic control.

4. Study the diagram and answer the questions follow.



4.1 What are the normal body temperatures for humans? (1)

4.2 The term use to describe the body's ability to regulate temperature. (1)

4.3 Differentiate between proses A and B. (6)

Proses A	Proses B