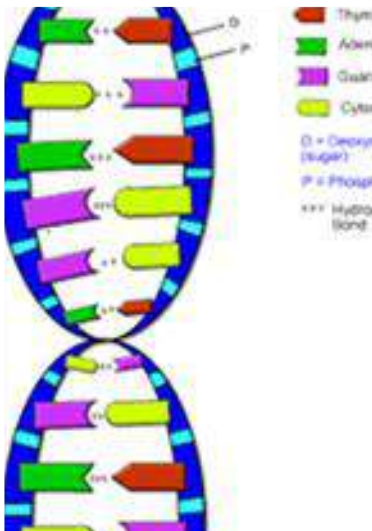


LIFE SCIENCES

ESSAYS

GRADE 10-12



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**NEW
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This document has been Created from data available from the internet and DBE's Website

FRANCE CHAVNGWANE

| LIFE SCIENCES ESSAYS GRADE 10-12

THIS DOCUMENT IS FOR FREE SUPPLY AS IT IS NOT MEANT FOR ANY BUSINESS PURPOSES BUT IT IS MEANT TO HELP ALL THE SOUTH AFRICAN LIFE SCIENCE LEARNERS AND TEACHERS. WE HAVE COMPILED THIS DOCUMENT WITH ALMOST ALL THE LIFE SCIENCES ESSAY FROM SOURCES AVAILABLE FROM THE INTERNET.

ACKNOWLEDGEMENT OF SOURCES

- 1) SOUTH AFRICAN DEPARTMENT OF BASIC EDUCATION
- 2) LIFE SCIENCE ACADEMICS
- 3) <http://www.testtakingtipa.com/study/>

GOOD LUCK TO YOU AS YOU ARE PREPARING YOURSELF FOR THE EXAMS WE WISH YOU ALL THE BEST AND I HOPE THIS DOCUMENT WILL BE YOUR FRIEND TO ASSIST YOU PREPARING YOURSELF FOR YOUR EXAMS. AFTER USING THIS DOCUMENT WE HOPE YOU WILL GET THE SKILL OF WRITING LIFE SCIENCE ESSAYS.



J.F CHAVANGWANE

Published : 20 August 2015

Eastern Cape, Mtata (South Africa)

ALL PREVIOUS EXAM QUESTION PAPERS

Old exam papers are a great way to revise and prepare for the upcoming National Senior Certificate (NSC) examinations. In this way you can find out what you already know and what you don't. Working through past examination papers also helps you manage your time better and be familiar with the terminology and vocabulary used in the actual exam. A full range of past matric examination papers and corresponding memorandums (answer papers) can be downloaded from the National Department of Basic Education website at www.education.gov.za . Click on "LEARNERS" on top menu bar and when the new page has loaded, click on "PAST EXAM PAPERS" under the "ASSESSMENT" banner on the right-hand side of the page. You will then find previous exam papers grouped by year. Alternatively Google "past matric papers" and click directly on the www.education.gov.za link provided. (Adapted from: I'solezwe lesiXhosa, 17 September, 2015 page 11)

IMPORTANT NOTICE

Some essays printed on this document are from NSC previous Examination Question papers and memorandums, as published on the Department of Basic Education's website. Other essays were adapted from Life Sciences Academics Facebook page. Please note that due to the new Curriculum and Assessment Policy Statements (CAPS), there have some changes in the subject curricula from 2014 to current (2015). These may affect some questions in the past exam papers in terms of relevance, emphasis and mark allocation. All learners using this document as study guide are advised to refer any queries to their relevant subject teacher for clarity.

LIFE SCIENCE ESSAY WRITING

Read the ESSAY title and find the key words in the title so you have an idea what it is all about.

Write down about FOUR or so sub-headings, then jot a few a few points. Don't spend more than 5 mins on this.

Re-read the ESSAY title again and work out what they want precisely from the title, then give a Heading to your essay. Write down your sub headings.

Under the sub headings make the important factual points, in sentence form. BUT only facts (no waffle). Make sure you have at least 17 points. The other 3 points the teacher/examiner will give you for the way you have put the essay together - the synthesis.

END OF THE YEAR NATIONAL SENIOR CERTIFICATE EXAMINATIONS : GRADE 12

PAPER 1	WEIGHTING	
Topic	%	MARKS
Term 1		
Meiosis	7	11
Reproduction in Vertebrates	4	6
Human Reproduction	21	31
Term 2		
Responding to the Environment (Humans)	27	40
Term 3		
Human Endocrine System	10	15
Homeostasis in Humans	7	11
Responding to the Environment (Plants)	7	11
Term 4		
Human Impact (Grade 11)	17	25
	100	150

PAPER 2	WEIGHTING	
Topic	%	MARKS
Term 1		
DNA: Code of Life	19	27
Meiosis	7	12
Term 2		
Genetics and Inheritance	30	45
Terms 3/4		
Evolution	44	66
	100	150

Source: Department of Basic Education 2014 Mind the Gap CAPS Grade 12 Life Science

GRADE 11 END OF YEAR EXAM

PAPER 1 – 150 MARKS: 2.5 HOURS

Photosynthesis 18%
Animal Nutrition 18%
Respiration 10%
Gas Exchange 15%
Excretion 15%
Population Ecology 24%

PAPER 2 – 150 MARKS: 2.5 HOURS

Biodiversity and Classification of Microorganisms 20%
Biodiversity in Plants and Reproduction 20%
Biodiversity in Animals 13%
Human Impact on the Environment: Current crisis for human survival: problems to be solved within the next generation 47%

PAPER 3 – 60 MARKS: 1 HOUR – PRACTICAL

The only way to pass your matric well is to manage your time effectively. Below are tips to help you get started.

1. FOCUS FOR 10 MINUTES

Take a subject and schedule 10 minutes of study time for it. Remove all distractions and focus on the work for the entire 10 minutes. This helps you to get the ball rolling and you may find that 10 becomes 30 or 60 minutes. This also helps tremendously with subjects that seem difficult and challenging at first.

2. BREAK UP YOUR WORK

Concentrate on doing small sections of work to the best of your abilities. The first tip amplifies the usefulness of studying smaller sections by increasing your focus. So instead of tackling an entire chapter or module start with a small sub section but do that section to the best of your abilities.

3. SETUP AND SHARE YOUR STUDY SCHEDULE

Let as many people know about your study times and tasks. This creates a self imposed pressure to get things done and ultimately removes the procrastination that befalls so many matric students.

4. RISE EARLY

Getting all your scheduled study time in early can give you a greater sense of achievement and freedom to enjoy the other things in your life. This is more important during the weekends and holiday periods, studying at midnight to catch up on your schedule will not help your concentration and retention.

5. REWARD YOURSELF

Give yourself time away from your studies but only if you deserve it. If you've studied consistently during the week then take a few hours off to relax with family or friends. Matric is tough and rest periods allow you time to recover and regain motivation to push through, so do not rob yourself - enjoy the year.

These five tips are very simple to implement and you may already be using a few of them but try to combine them all and see the results that you achieve. Studying for long hours on end will not guarantee success but concentrating fully during reasonable study time will.

STUDY SMART

Study Tips & Study Skills

Students with better study methods and strategies score higher on their exams.

Everyone is different. Different methods work for different people; the following are only suggestions on improving upon your current studying techniques.

It is best to review the material right after class when it's still fresh in your memory.

Don't try to do all your studying the night before the test. Instead space out your studying, review class materials at least several times a week, focusing on one topic at a time.

Have all of your study material in front of you: lecture notes, course textbooks, study guides and any other relevant material.

Find a comfortable and quiet place to study with good lighting and little distractions (try avoiding your own bed; it is very tempting to just lie down and take a nap).

Start out by studying the most important information.

Learn the general concepts first, don't worry about learning the details until you have learned the main ideas.

Take notes and write down a summary of the important ideas as you read through your study material.

Take short breaks frequently. Your memory retains the information that you study at the beginning and the end better than what you study in the middle.

Space out your studying, you'll learn more by studying a little every day instead of waiting to cram at the last minute. By studying every day, the material will stay in your long-term memory but if you try to study at the last moment, the material will only reside in your short-term memory

that you'll easily forget.

Make sure that you understand the material well, don't just read through the material and try to memorize everything.

If you choose to study in a group, only study with others who are serious about the test.

Test yourself or have someone test you on the material to find out what your weak and strong areas are. You can use the review questions at the end of each chapter, practice tests that the teacher may give out or other pertinent materials.

Listening to relaxing music such as classical or jazz on a low volume can relieve some of the boredom of studying.

Don't study later than the time you usually go to sleep, you may fall asleep or be tempted to go to sleep, instead try studying in the afternoon or early evening. If you are a morning person try studying in the morning.

**IF IT IS
IMPORTANT
TO YOU, YOU
WILL FIND A
WAY. IF
NOT, YOU
WILL FIND
AN EXCUSE.**

Good luck I wish you all the best and I hope this will help you more!!!

[Call 0746833042](tel:0746833042) and Email Chavangwane7@gmail.com

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MENSTRUAL CYCLE ESSAY

Describe the menstrual cycle and how it is influenced by different hormones.

- The menstrual cycle is a series of events that occur in the female body to prepare it for possible pregnancy✓
 - Which involves ovarian cycle✓
 - and the uterine cycle✓
 - It takes an average of 28 days✓
 - The pituitary gland✓/hypophysis
 - secretes FSH✓
which stimulates the development of a primary follicle✓ in the ovary
 - The developing follicle✓/Graafian follicle
 - secretes oestrogen✓
which stimulates the thickening of the lining of the uterus✓/endometrium
 - Around day 13 pituitary gland✓/hypophysis
 - secretes LH✓
 - which cause ovulation to occur✓
 - The remains of the Graafian follicle develops into the corpus luteum✓
which secretes the progesterone✓
which continues to stimulate the thickening of the uterus✓
 - High levels of progesterone✓
 - inhibits the production of FSH✓
so that the ovaries are no longer stimulated to produce another follicle✓
 - If fertilisation does not occur, the corpus luteum degenerates✓
and stops producing progesterone✓
 - The pituitary gland/hypophysis is no longer inhibited in its production of FSH✓ and a new follicle develops
 - The thick endometrium is no longer maintained✓/ it degenerates
and is shed together with blood/menstruation takes place
- Any (17)

PROTEIN SYNTHESIS AND DNA REPLICATION ESSAY

Protein synthesis Transcription

- DNA double helix unwinds
- weak hydrogen bonds of DNA break
- forming two single strands of DNA
- One strand acts as template
- to form a complementary strand which is mRNA (A – U; G – C)
- using free RNA nucleotides from the nucleoplasm
- Three adjacent bases on mRNA make up a codon
- which codes for an amino acid.
- mRNA moves out of the nucleus
- through the nuclear pore
- into the cytoplasm
- where it attaches to a ribosome

(Max. 7) (7)

Translation

- according to the codons of mRNA
- t-RNA molecules with complementary anticodons
- bring the required amino acids to the ribosome
- The amino acids link together by peptide bond
- to form the required proteins.

(Max. 4) (4)

DNA replication

- DNA double helix unwinds
- weak hydrogen bonds between nitrogenous bases break
- and the two DNA strands unzip/separate
- Each original DNA strand serves as template to form a new strand
- by attaching to free nucleotides from nucleoplasm
- to form complementary strands
- Each DNA molecule now consists of one original strand and one new strand.
- The result is two genetically identical DNA molecules.

PROTEIN SYNTHESIS AND MUTATION ESSAY

Describe the process of protein synthesis and also describe the impact that the two types of gene mutation may have on the formation of proteins.

Content (17)
Synthesis (3)
(20)

Possible Answer to Essay:

The process of protein synthesis occurs in two steps, namely transcription and translation.

TRANSCRIPTION

- Double stranded DNA unzips
 - When the hydrogen bonds break
 - One strand is used as a template
 - To form mRNA
 - Using free RNA nucleotides from the nucleoplasm
-
- The coded message for protein synthesis is thus copied onto mRNA
 - mRNA moves from the nucleus to the cytoplasm and attaches to the ribosome Max 6

TRANSLATION

- tRNA collects amino acids
- tRNAs, with amino acids attached, become arranged on the mRNA
- The anticodons on the tRNAs match complementary bases on the codons of mRNA
- Amino acids become attached by peptide bonds to form the required protein
- Each tRNA is released to pick up more amino acids Max 6

IMPACT OF GENE MUTATIONS ON PROTEIN SYNTHESIS

- Errors/mistakes/changes may occur during DNA replication

- **POINT MUTATION:** replacing one base of a codon with another
- Small change that may possibly result in one amino acid changing in a protein

- **FRAMESHIFT MUTATION:** addition/deletion of one or more bases of a codon
- Resulting in changing the order/sequence of all the bases of the codons
- Resulting in forming a different protein with different functions

Max 5

NEPHRON ESSAY

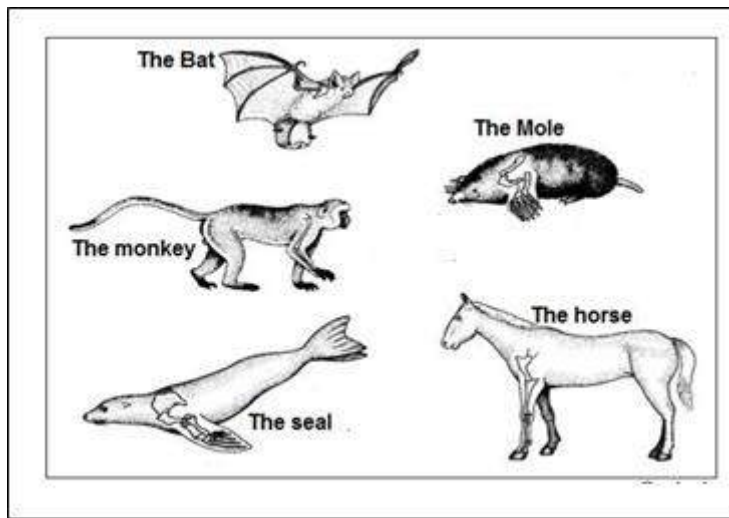
Write a short essay explaining the homeostatic functioning of the nephron if a person is suffering from dehydration

- When the water content of the body drops below normal
 - the osmotic potential of the blood increases ✓
 - which stimulates the osmoreceptors in the hypothalamus ✓
 - which produces ADH
 - to transmit impulses to the pituitary gland (hypophysis) ✓
 - to release more ADH ✓ in to the blood
 - ADH is transported by bloodstream to the kidney ✓
 - where this hormone increases the permeability ✓ of the walls of the distal convoluted tubule and collecting duct ✓
 - more water ✓ is re-absorbed from the filtrate ✓
 - and small amount of concentrated urine ✓ is excreted
 - the adrenal gland ✓ secrete aldosterone ✓
 - which cause sodium ions ✓ to be actively ✓ pumped out of the filtrate ✓
 - in the ascending limb of loop of Henle ✓
 - in to the tissue fluid of the kidney medulla ✓
 - this creates a low water potential ✓ and
 - water moves by passive osmosis ✓
 - from the collecting tubule ✓
 - in to the tissue fluid of the medulla ✓
 - from where it is absorbed in to the blood capillaries ✓

FORELIMBS MODIFICATION AND FUNCTIONS ESSAY

Charles Darwin's explanation for the differences in the structures of the forelimbs

Forelimbs of mammals are built on the same pattern but have different functions. Study the diagram of FIVE mammals and write a mini-essay where you discuss the modification and functions of their forelimbs. Include in your discussion Charles Darwin's explanation for the differences in the structures of the forelimbs of the five mammals although they are built on the same pattern.



The Bat

- The forelimbs have become wings for flying.
- The first digit is hook-like to hang from trees
- while the last four digits have become elongated to make up the wing

The monkey

- The forelimbs are very long
- to allow it to grasp trees while it is climbing
- and swinging

The mole

- Has a pair of short, spade-like forelimbs
- that are modified for digging

The seal

- The forelimbs have become flippers
- for steering and
- maintaining equilibrium during swimming.

The horse

- The forelimbs are adapted for support
- and running with the third digit being very elongated ending in a hoof

Charles Darwin's explanation:

- Forelimbs of mammals arose from a common ancestor
- in which the forelimb had the same pattern.
- The forelimbs of the five mammals show variations
- because of having been modified

ALLIEN PLANTS ESSAY

Write a short essay in which you discuss FOUR possible reasons why alien plants were imported to South Africa, FOUR unfavourable effects of alien plants in South Africa and FOUR strategies to eradicate alien plants.

Possible reasons why alien plants were imported to South Africa.

- Used as wind breaks in farming land.
- For the manufacture of timber products and paper.
- Various plants were imported for agricultural purposes.
- Used in tannery.
- For aesthetic reasons.
- As ornamental plants.
- Support in mines.

The unfavourable effects of alien plants in South Africa.

- Alien plants out-compete the indigenous plants, causing major changes to the habitats in which they occur and affect the functioning of entire ecosystem.
- (They become invasive) e.g. water hyacinth cover the surface of water and block out the sunlight, thus disturbing the food webs in these habitats.
- They cause major damage to biodiversity of the region.
- They are known to use more water than the indigenous plants.
- Increase the risk of soil erosion.
- Invasion of alien plants destroys many beautiful indigenous plants and therefore, reduces the natural beauty of South Africa.
- Decreases natural food resources and habitat of wild animals.

Strategies to eradicate alien plants

- Mechanical control: Removal of alien plants by hand or with machines. This method is only effective in controlling small populations and also it minimises possible harm to non-invasive alien plants.
- Chemical control: Chemical compounds can be used to prevent the spread of alien invasive plants. This method is effective in both large and small areas. This method has the potential of contaminating land and water resources. Furthermore, indiscriminate use of chemicals can harm non-invasive plants as well as other useful animals in that area.
- Biological control: It involves the release of a specific species to restrict the spread of the invasive plants. The invasive alien plants can be deliberately infected by pathogens to reduce their ability to reproduce.
- Stricter control of imports of alien plants by the government at every port of entry.
- Introduce heavy penalty for importing exotic plants from abroad.
- Regular monitoring and consistent follow-up on the various interventions that are initiated by the municipalities.

THE HEART ESSAY

The cardiac cycle includes all events taking place as the blood flows through the heart during one complete heart beat.

Write an essay in which you explain or describe the changes the heart undergoes during one heart beat.

General diastole

- The muscles of both the atria and the ventricles relax
- Blood flows into the atria from the vena cava
- and the pulmonary veins ✓. Blood flows into the ventricles
- past the open AV valves namely the bicuspid valve
- on the left and the tricuspid valve
- on the right. The semi-lunar valves are now closed
- to prevent blood from the aorta and pulmonary arteries to flow back towards the ventricles

Atrial systole

- The two atria contract
- which forces blood past the open AV valves
- into the ventricles
- The ventricles are now relaxed

Ventricular systole

- As the atria relax
- the ventricles begin to contract
- Blood is pumped past the semi-lunar valves
- into the aorta ✓ and the pulmonary arteries.
- The AV valves are now closed

ECOTOURISM ESSAY

Write a mini essay on ecotourism in South Africa using the following guideline Brief explanation of what ecotourism entails, Long term sustainability and Possible threat to Ecotourism

(Ecotourism

- Ecotourism is mainly inclined to promote environmental awareness and instil a sense of appreciation of natural formations and beauty.
- It makes people respect the existence of other living organisms (fauna and flora) that shares the resources of the planet earth
- Its main clients are people who are interested in preserving the environment.
- A potential ecotourist prefers to spend his/her holidays in a natural environment to experience and be part of the environment
- They like to visit and spend time in quiet natural settings such as unspoiled beaches, river mouths, waterfalls, wet lands with lush green forests, gorges, mountains etc.
- Always prefer to use eco-friendly mode of transport to cause less pollution and damage to fauna and flora
- Encourages people to consume naturally grown, fresh produce from the area
- Greater emphasis is placed on the well-being of local people and constantly look for ways and means to contribute towards the local economy
- Eco-friendly accommodation is provided for visitors to minimise the possible human impact on the surrounding area
- Renewable energy is utilised wherever possible

Long term sustainability

- Educate the local population about the importance of conserving the natural resources.
- The involvement of the local community should be prioritised.
- Active participation generates income for local communities. e.g. selling composts, organic food products.
- Job creation alleviates poverty. e.g. tour guides, security personnel, and creating opportunities to sell and exhibit art work.
- Ownership of the concept leads to proper caring and protection of the fauna and flora. e.g. prevention of poaching, illegal smuggling of exotic animals and plants, discourages over exploitation of natural resources.
- Part of the income generated can be utilised for conservation and rehabilitation projects.
- Cementing strong partnership with the private and public sector could provide more management and financial support

Possible threats to ecotourism

- Poaching / illegal hunting
 - Crime and violence against tourists
 - Pollution
 - Illegal trade of exotic plants and animals
 - Illegal occupation of land and the establishment of squatter camps
-
- Natural disasters. e.g. wild fires, droughts, floods, etc.
 - Deforestation
 - Extension of farming lands
 - Illegal dumping of waste
 - Illegal developments e.g. hotels and golf estates, airports, stadia. etc.
 - Building of dams in an ecologically sensitive area
 - Mining
 - Exploitation of tourists

BREAST CANCER ESSAY

Write a short essay on Possible causes or risk factors, Symptoms and Treatment of breast cancer

Causes or risk factors

- Family history of breast cancer
- Heavy smoking/drinking
- Late menopause
- Early menstruation
- Possess breast cancer gene
- Late conception or no conception (first child is born after 35 years of age)
- Obesity after menopause
- Lack of exercise
- Use HRT (Hormone Replacement Therapy) after menopause
- Use of birth control pills for five years and longer

Symptoms

- Swollen glands under the arm
- Sunken nipple
- Secretion from nipple – bloody secretion
- Shape of breast changes
- Change in the texture of skin of the breast
- Lump or thickening of the breast.
- Pain in one spot that does not vary with monthly period
- Swelling, redness or warmth that does not go away
- A sore, itchy or scaling area on one nipple

• Treatment

- Surgery
- Chemotherapy
- Radiotherapy
- Hormonal therapy

RESOURCE MANAGEMENT ESSAY

You are a member of a task team that must effectively deal with all aspects of local environmental issues in your town. The team includes you as a Member of Parliament, a health official, a farmer and a traditional healer.

Describe in essay form the input of each member as they try to sustainably manage the region's resources

Member of Parliament:

- Can authorize a number of environmental impact studies to assess the feasibility of projects, constructions, etc in the city.
- This would minimize adverse impact on the environment;
- new laws could be promulgated to control emissions from factories, vehicles, harvesting of natural resources, protecting plantations and natural areas, reviewing permits for fishing, hunting, etc.
- Can make state funding available for environmentally friendly projects, speed up service delivery to rural communities and informal settlements, etc.
- Follow up on international treaties (Kyoto Protocol, etc.), etc.

Health Official:

- Can launch educational awareness programmes relating to various issues affecting the environment;
- do research to identify trends in health matters that could impact on the environment; form educational partnerships with schools in the city to promote environmental awareness;
- arrange workshops and seminars for the community to learn more about the environment, launch community projects for the members of the public to participate in, etc.

Farmer:

- Practice sustainable agriculture, practice no-tilling farming, which enable better drainage and less soil compaction;
- use organic fertilizers, add only nutrients to the soil;
- use integrated pest control systems, encouraging natural predators of pests;
- mixed cropping and crop rotation practices help with pest control and soil fertility,
- can participate in ecotourism projects etc

Traditional healer:

- Can encourage indigenous citizens to participate in state sponsored activities relating to nature conservation,
- partnerships with indigenous people; community-based activities can benefit the local community,

- can assist in integrating traditional and modern practices, etc.
- Develop cultivation and nurseries for indigenous plants

METABOLIC RATE, CO₂ AND GLUCOSE ESSAY

An increase in the metabolic rate during strenuous exercise causes a decrease in the glucose level and an increase in the CO₂ level in the blood.

Describe the mechanism that leads to an increase in the metabolic rate and the mechanisms involved in increasing the glucose level and decreasing the CO₂ level back to normal

Increasing the metabolic rate

- To increase the metabolic rate the level of thyroxin must increase
- The pituitary gland is stimulated
- to secrete more TSH
- which stimulates the thyroid gland
- to secrete more thyroxin

Increasing the level of glucose

- As a result of the decrease in glucose level the pancreas is stimulated
- to secrete glucagon
- which stimulates the conversion of stored glycogen to glucose
- in the liver/muscles - The glucose is then released into the bloodstream
- The glucose level in the blood increases and returns to normal

Decreasing the level of CO₂

- High CO₂ levels stimulate the receptor cells in the carotid artery
- The stimulus is converted to an impulse
- and sent to the medulla oblongata
- which stimulates the heart
- - to beat faster
- bringing blood with CO₂ quickly to the lungs
- It also stimulates the breathing muscles
- to increase the depth and rate of breathing
- CO₂ is exhaled quickly from the lungs
- The CO₂ level in the blood decreases and returns to normal

MUTATION ON PROTEIN SYNTHESIS AND EVOLUTION ESSAY

Describe how a gene mutation may influence the structure of a protein. Also use ONE example to describe the role of mutations in evolution in present times

MUTATIONS AND PROTEIN SYNTHESIS

- A mutation is a change in the nucleotide/nitrogenous base sequence
- of a DNA molecule/a gene
- since mRNA is copied from the DNA molecule
- during transcription
- This will result in a change in the codons
- As a result, different tRNA molecules
- carrying different amino acid will be required
- The sequence of amino acids changes
- resulting in the formation of a different protein
- If the same amino acid is coded for
- there will be no change in the protein structure

Any 9

MUTATIONS AND EVOLUTION IN PRESENT TIMES

- In a population of insects/bacteria/HI viruses/Galápagos' finches - mutations are a source of variation
- which may make some organisms more resistant/better suited
- to insecticides/antibiotics/antiretroviral medication/ drought
- Those individuals that are not resistant/suited will die
- whereas - those that are resistant/ well suited, will survive
- to pass the resistant allele/resistance on to their offspring
- This is known as natural selection
- As a result, individuals of the future generations will be resistant to the insecticides/antibiotics/antiretroviral medication/adapted to drought

ACCOMODATION, HEARING AND BALANCE ESSAY

A goalkeeper in a soccer match prevented a goal from being scored when he dived to his right after the ball was kicked towards him. Just before he dived, he heard his team-mate shout, 'your ball'.

Describe how his eyes adjusted to see the ball as it travelled towards him and describe how he heard his team-mate and maintained his balance as he dived to save the ball.

As the ball moved towards the goalkeeper:

Accommodation took place

- Ciliary muscles contracted
- Suspensory ligaments became slack
- This reduced the tension on lens
- Lens became more convex/round
- Refractive power of the lens increased
- Image of the ball fell on the retina

Any

Hearing The shout of his team-mate was heard by the goal keeper as follows:

- The sound waves were directed by the pinn
- through the auditory canal
- to the tympanic membrane/eardrum
- causing it to vibrate
- The vibrations of the tympanic membrane were transferred to the ossicles
- in the middle ear - which eventually caused the oval window to vibrate
- This set up pressure waves in the cochlea
- This stimulated the Organ of Corti the cochlea
- to convert this stimulus into a nerve impulse
- which was then transmitted along the auditory nerve
- and interpreted in the cerebrum

Any

Balance and equilibrium As he dived:

- A change in the direction and speed of the body
- causes the movement of fluid in the semicircular canals
- which stimulates the cristae
- A change in the position of the head
- stimulated the maculae
- in the utricle and saccule
- The stimuli were converted into impulses
- which were transported along the auditory nerve
- and interpreted in the cerebellum
- which then sent impulses to the muscles
- to restore balance and equilibrium

MEIOSIS, MUTATION AND NATURAL SELECTION ESSAY

Describe how meiosis and different types of mutations contribute to genetic variation and the role of this variation in natural selection.

Meiosis

- Crossing over occurs during prophase I
- Homologous chromosomes / chromatids overlap
- at points called chiasma/ chiasmata
- Genetic material is exchanged
- resulting in new combinations of genetic material

Random arrangement of chromosomes

- occurs during metaphase
- so that they separate in a random/ independent manner
- resulting in new combinations of genetic material

Mutations

- A gene/ (point and frameshift) mutation occurs
- as a result of a change in sequence of nitrogen bases
- in the DNA molecule
- A chromosome mutation occurs as a
- result of a change in the structure of a chromosome/ number of chromosomes during meiosis
- Mutations that occur in sex cells
- are passed on to the new generations
- creating new characteristics

Role of variation in natural selection

- Organisms of a particular species shows a great deal of variation
 - Some individuals may have characteristics that are favourable/ any example
 - Others may have characteristics/any example that are unfavourable
 - If there is competition/changing environmental conditions/ Selective pressure by the environment
-
- organisms with favourable characteristics survive
 - and reproduce
 - and pass these favourable characteristics to their offspring
 - while organisms with unfavourable characteristics will die out
 - Over time the whole population will have this favourable characteristic

ADRENALIN & HEARING ESSAY

While walking in the bush Paul hears a sound which he thinks is the roar of a lion. He immediately runs to safety.

Describe how he hears the sound and describe the role of adrenalin to ensure that his muscles are able to function efficiently while he runs away.

Hearing

- Pinna traps/directs the sound waves
- Into the ear canal/meatus
- This causes the tympanic membrane to vibrate
- The vibration is transmitted to the auditory ossicles
- The ossicles amplify the vibration
- and transmit it to the oval window
- The oval window vibrates
- creating waves
- in the fluid/endolymph of the cochlea
- which stimulates the Organ of Corti
- to convert the wave into an impulse
- The impulse travels along the auditory nerve
- to the cerebrum
- where it is interpreted as the roar of the lion

Role of Adrenalin

- More adrenalin is secreted
- Adrenalin increases muscle tone
- And causes the liver/muscles to convert glycogen into glucose
- The heart rate increases
- so that the muscles receive more glucose
- and oxygen
- needed for cellular respiration
- to provide the energy
- for the muscles to contract efficiently
- The rate of breathing increases
- and the depth of breathing increases
- to exhale carbon dioxide from the muscles faster
- and inhale oxygen faster
- Constriction of blood vessels to the gut/skin
- and dilation of blood vessels to the vital organs/brain/muscles
- allowing more blood to be supplied to vital organs/brain/muscles

OUT OF AFRICA HYPOTHESIS ESSAY

Fossils of the bipedal primates Ardipithecus, Australopithecus and early Homo species are used to support the 'Out of Africa' hypothesis.

State the 'Out of Africa' hypothesis. Describe the evidence that supports the 'Out of Africa' hypothesis and the evidence that shows that the three primate genera mentioned above, were all bipedal

HYPOTHESIS

- All modern humans*/Homo sapiens
- originated in Africa
- and migrated to other parts of the world

FOSSIL EVIDENCE

- Fossils of Ardipithecus were found ONLY in Africa/Rift Valley/Ethiopia/South Africa
- Fossils of Australopithecus were found ONLY in Africa/Rift Valley/Ethiopia/South Africa –
- The fossils of Homo habilis were ONLY found in Africa
- The OLDEST fossils of Homo erectus were found in Africa
- The OLDEST fossils of Homo sapiens were found in Africa

GENETIC EVIDENCE

- Mitochondrial DNA
- Is inherited only from the maternal line
- Analysis of mutations
- on this mitochondrial DNA
- shows that the oldest female ancestor were located in Africa
- and that all humans descended from her/mitochondrial Eve
- The Y chromosome shows the paternal line

CULTURAL EVIDENCE

- The OLDEST/most primitive artefacts (tools, cutlery, art etc.)
- were found in Africa

BIPEDALISM

- The fossils of all three genera indicate that:
- The foramen magnum
- is located in a more forward position
- The pelvis is wider and shorter
- The spine is S-shaped

OSMOREGULATION AND BALANCE ESSAY

Nontobeko had been walking in the desert, without water, for two days, when she suddenly heard a sound behind her. She turned her head and saw a snake coming towards her. She became scared and turned around to run away. As she was running, she tripped and fell.

Describe how her body regulated water content during the two days and describe how her balance would have been restored after she fell down.

Regulating water

- The water levels in her body are low/she is dehydrated
- Osmoreceptors in the hypothalamus
- are stimulated by the low water levels and send impulses
- to the pituitary gland/hypophysis
- which is stimulated to secrete more ADH
- ADH increases the permeability
- of the tubules/collecting ducts and distal convoluted tubules
- in the kidneys - More water is reabsorbed
- and passed to the surrounding blood vessels
- Less urine is produced
- and the urine is more concentrated
- in order to conserve water
- Aldosterone is secreted by the adrenal glands
- to ensure more Na⁺ ions
- are reabsorbed by the distal convoluted tubules –
- The increase in Na⁺ ions in the blood
- causes more water to be reabsorbed
- into the blood capillaries

Balance is achieved in the following way:

- The maculae
- in the utricle and saccule
- and the cristae in the semi-circular canals
- are stimulated - They generate impulses
- which is transmitted through the auditory nerve
- to the cerebellum
- where they are interpreted
- Impulses are transmitted via the motor neuron
- to skeletal muscles

NATURAL SELECTION AND SPECIATION ESSAY

The anole lizard of the Caribbean Islands represents a group of about 150 closely related species, which evolved within the past 50 million years from a single species.

Use this example to describe how natural selection led to the process of speciation that gave rise to the 150 different species of lizards.

Natural selection and speciation

- The original species of anole lizards was separated
- Into different populations
- by a geographical barrier
- which is the sea
- There was no gene flow
- between the separated populations
- Each population was exposed to different environmental conditions
- on each island
- Because there is variation
- amongst the lizards
- Natural selection occurred independently
- in each population
- Some had favourable characteristics
- to survive on a specific island
- while others did not
- The ones that did not have the favourable characteristics died
- The ones with the favourable characteristic survived
- and reproduced to pass the gene for the favourable characteristics
- to the next generation
- And over many generations the favourable characteristic becomes more frequent in the population
- each population became different from the other
- over time - genotypically
- and phenotypically
- Even if the populations were to mix again
- they would not be able to reproduce/interbreed with each other

SPERMATOGENESIS ESSAY

Sperm is produced, transported and then combined with secretions from the accessory glands to form semen. The semen is then transferred into the body of the female where it meets the ovum.

Describe all the processes referred to in the statement above and explain THREE structural adaptations of the sperm for fertilisation

Spermatogenesis

- Takes place under the influence of testosterone
- in the seminiferous tubules/testis
- Diploid cells/germinal epithelium
- undergo meiosis
- to form haploid sperm cells

Formation and transport of semen

- Sperm mature/are temporarily stored
- in the epididymis
- During ejaculation
- sperm move into the vas deferens
- As it passes the seminal vesicles
- prostate gland and
- Cowper's glands
- fluids are added that provide nutrition,
- promote the movement of the sperm
- and neutralise the acids
- produced in the vagina
- The semen passes through the urethra
- of the penis
- into the vagina
- during copulation
- and swims up the Fallopian tube
- where it meets the ovum

Structural suitability of the sperm cell for fertilisation

- The acrosome
- contains enzymes to dissolve a path into the ovum
- Nucleus of the sperm
- carries genetic material of the male/haploid number of chromosomes
- Many mitochondria
- in the middle piece - release energy
- so that sperms could swim
- The presence of a tail enables sperm cells to swim
- towards the ovum
- The contents of the sperm cell such as the cytoplasm is reduced/condensed
- - making the sperm light for efficient movement

- Sperm is streamlined
- to allow for easier movement

CHROMOSOMES AND MEIOSIS ESSAY

Describe the structure and arrangement of chromosomes making up the normal human karyotype. Also describe the behaviour of the chromosomes during the different phases of meiosis I.

STRUCTURE AND ARRANGEMENT OF CHROMOSOMES

- Each chromosome comprises two chromatids
- held together by a centromere
- There are 23 pairs/46 chromosomes in
- human somatic cells/body cells
- which are arranged into homologous pairs
- that are similar in length
- carry genes for the same characteristics
- have alleles of a particular gene at the same loci and
- have the same centromere position
- Each somatic cell has 22 pairs/44 autosomes
- and - a pair/2 gonosomes/sex chromosomes/X and Y chromosomes
- Autosomes are arranged in pairs from largest to smallest
- in a karyotype - Males have XY chromosomes
- Females have XX chromosomes
- The X chromosome is larger than the Y chromosome

BEHAVIOUR OF CHROMOSOMES IN MEIOSIS I

- During prophase I –
- chromosomes pair up/homologous pairs/bivalents form
- Crossing over/exchange of genetic material occurs
- between chromatids/adjacent chromosome pairs
- During metaphase I of meiosis
- homologous chromosomes/chromosome pairs are arranged
- at the equator
- of the cell - in a random way
- with the chromosome attached to the spindle fibre
- During anaphase I
- chromosome pairs separate/chromosomes move to opposite poles
- During telophase I
- the chromosomes reach the poles of the cell

DNA REPLICATION AND PROTEIN SYNTHESIS ESSAY

Each somatic cell in the human body contains identical DNA. This DNA controls the synthesis of all proteins required for the structure and functioning of the human body. Describe how DNA controls protein synthesis with the assistance of other nucleic acids found in the human cell. Also describe how DNA is replicated before the start of cell division to ensure that all body cells contain identical genetic information.

Protein synthesis

Transcription

- DNA double helix unwinds
- weak hydrogen bonds of DNA break
- forming two single strands of DNA
- One strand acts as template
- to form a complementary strand which is mRNA / (A – U; G – C)
- using free RNA nucleotides from the nucleoplasm
- Three adjacent bases on mRNA make up a codon
- which codes for an amino acid.
- mRNA moves out of the nucleus
- through the nuclear pore
- into the cytoplasm
- where it attaches to a ribosome

Translation

- according to the codons of mRNA
- t-RNA molecules with complementary anticodons
- bring the required amino acids to the ribosome
- The amino acids link together by peptide bond
- to form the required proteins.

DNA replication

- DNA double helix unwinds
- weak hydrogen bonds between nitrogenous bases break
- and the two DNA strands unzip/separate
- Each original DNA strand serves as template to form a new strand
- by attaching to free nucleotides from nucleoplasm
- to form complementary strands
- Each DNA molecule now consists of one original strand and one new strand.
- The result is two genetically identical DNA molecules.

GENETIC VARIATION ESSAY

Describe the mechanisms that cause variation within a species.

Sources of genetic variation:

meiosis

- Gametes produced by meiosis are different because of:
- crossing over during first prophase
- random arrangement of chromosomes
- during first metaphase
- and second metaphase

Random mating as a source of variation

- In humans and some other mammals, mating takes place between individuals who select mating partners of a particular kind.
- In most other species, mating takes place randomly amongst all individuals within the population / more than one mating partner

Chance fertilisation of egg cells by sperm cells

- Usually more than one egg cell and sperm cells are produced
- and these are all different.
- Fusion of many types of sperm cells and egg cells
- can produce many different types of offspring.

Mutations

- Mutations are sudden, random changes in the genetic code of an organism
- A gene mutation occurs
- as a result of a change in the sequence of nitrogen bases in the DNA molecule
- can result in the formation of a different protein
- leading to new/different characteristics
- A chromosome
- mutation occurs
- as a result of a change in the structure / number of chromosomes
- Mutations occurring in sex cells
- are passed on to offspring and new generations
- resulting in new characteristics being formed

FOOD SECURITY, GMO & FARMING ESSAY

Write an essay in which you explain what is meant by the concept of food security. Describe also the ways in which poor crop farming practices pose a threat to food security in South Africa. Finally mention how genetically modified food may help to address the problem of food shortage

Food security.

- The state of having reliable access
- to a sufficient quantity of affordable, nutritious food.

Poor crop farming practices

- monoculture planting the same crop over and over
- because it is cost effective, but
- it attracts more pests and it
- reduces quantity of crop produced
- this makes food more expensive to buy / less affordable
- pest reduce the quality of crop making
- it necessary to use more pesticides, more money spent
- pesticides / insecticides kill useful crops also
- pesticides are bad for human health
- affects nerves - they also cause pollution and it
- also reduces biodiversity
- monoculture causes top soil erosion, leading to
- more fertilisers to be used
- over fertilisation causes oxygen deprived soil
- leads to less production of crops in future
- and also produces greenhouse gases
- poor irrigation/ poor infrastructure used due to
- lack of awareness / education / experience / motivation

Genetically modified food -

- genes for desired traits are removed
- from one plant and introduced into another plant
- to make better crop
- examples of desired traits
- resistance to diseases
- short maturity
- higher yield
- cheaper food
- increases nutritional value
- longer shelf life
- bigger and more attractive food, etc.
- helps poor / starving / famine people
- to make food accessible and available

PETRIFIED FOSSILS ESSAYS

Describe how petrified fossils are formed in sedimentary rock and give examples of fossils found in places other than rock. Explain how scientists date these fossils and how fossil tourism can be an advantage to the country

Fossil formation

- Dead organisms settle to the bottom of lakes, sea and swamps (body of water).
- Mineral salts in the water also settle to the bottom.
- Soft body parts decay leaving only bones.
- Mineral salts filter into the bones of organism.
- Turning it into stone / this is called petrification.
- Layers of sediment are deposited on top over the years.
- As the layers pile up, their weight presses down on the older ones which turn into rock.
- Alternatively, the bones may completely decay leaving a cast of the organism.
- The void left behind may then fill with minerals making a stone replica of the organism.

Other types of fossils

- Fossils found in ice e.g. mammoth
- Fossils found in tar e.g. sabre-toothed tiger
- unaltered fossils
- Fossils trapped in amber/resin e.g. insects
- Carbonised fossils e.g. coal

Dating fossils

- Radiometric dating Attempts to find out how long ago a particular fossil was formed / gives the real age of the fossil.
- Scientists observe the breakdown of radioactive substances in the rock / breakdown of radioactive carbon-14/uranium/potassium etc.
- They compare the amount of radioactive substance remaining
- to the substance it has broken down into / carbon-14 to nitrogen-14/ uranium to lead / potassium to argon.
- Relative dating the age of the fossil is worked out by comparing to the age of another fossil or geological event.
- It can only tell us whether a particular fossil was formed before or after a particular fossil or event
- Fossils found in lower layers were formed before/are older than fossils found in an upper layer.

Advantages of fossil tourism

- Creates employment / job opportunities for the local community e.g. field workers for digs, tour guides, sculptures and artists
- Creates business opportunities e.g. selling curios.
- Education of locals and visitors about our geological history.
- Improves the economy of the country as foreign tourists bring more cash.
- Money gained through fossil tourism can be used to carry out further excavation.
- Fossil sites will be protected as they are a source of income.

INVANSIVE SPECIES & WATER QUALITY ESSAY

Write an essay in which you describe how invasive alien plants affect the quality of water and discuss various ways of controlling invasive alien plants including their advantages and/or disadvantages.

EFFECT OF ALIEN INVASIVE SPECIES ON WATER QUALITY

- They form a continuous mat on the surface of water.
- This blocks light from reaching the lower levels of the water.
- Photosynthesis at the lower level of water stops.
- The plants die and decompose.
- The population of decomposers increases,
- using up large amounts of oxygen.
- Aquatic animals/ fish/frogs die
- due to lack of oxygen.
- This decreases the quality of water.
-

MECHANICAL CONTROL

- Removal of invasive species by hand or with machines
- Effective in controlling small populations

Advantage: minimizes harm to non-invasive plants and animals

- **Disadvantage:** Labour intensive and time consuming

CHEMICAL CONTROL

- Uses chemicals /chemical compounds to control spread of alien invasive species
- Effective in both large and small populations
- **Disadvantage:** possible contamination of land and water resources
- and may result in the killing of desirable plants and animal species.
- Target species may develop resistance to the chemicals

BIOLOGICAL CONTROL

- Uses a specific species to control the spread of alien invasive species
- Both indigenous and non-indigenous species may be used
- Can be both environmentally safe
- and successful Use of non-indigenous species may increase alien invasive species .

SOLID WASTE MANAGEMENT ESSAY

“Solid waste has become a great cause for concern in South Africa. Each person in South Africa generates between 0,5 kg to 2 kg of waste every day. This equates to about 15 million tons of domestic waste each year.”

If you were appointed as the head of the waste disposal division of your town/city, explain FOUR strategies you would use to manage the waste.

Waste management strategies:

- **Landfill management and recovery of energy from burning it.**
- Utilise the heat generated from the burning of landfill sites
- to generate electricity thus saving on the electricity bill for heating and cooking.
- Investigate methods to collect and utilise methane gas as a fuel.
- Place plastic liners under landfill sites during construction.
- to prevent leaching from waste into groundwater / rivers/oceans.
- Rehabilitate old landfill sites to prevent pollution. / phytoremediation.

Recovery and recycling

- Encourage citizens of the city to put different types of waste into different waste containers/bins of different colours.
- Partnership with recycling companies for improved collection of different waste.
- Fines for people that do not separate the waste into different bins.
- This could generate income and reduce transport costs. • • Educate people on how to use organic waste
- for example, to make compost which could fertilise soil, so they can plant vegetables.
- New products can be made from recycled materials.
- which benefits the economy by creating employment / alleviate poverty.
- Clean up dumping sites and build useful facilities like sports fields.

Educate citizens and companies to reuse waste.

- Glass containers for milk, cold drinks and alcohol etc.
- This will reduce the need to produce more of these items
- thus, saving energy and money.

Reducing waste

- Charge/penalise people extra if they generate more waste.
- Encourage citizens to manage waste more efficiently/renewable.
- Reward those who manage efficiently.
- Recycle, re-use and reduce waste

EUTROPHICATION ACID MINE DRAINAGE ESSAY

Eutrophication and acid mine drainage are two of the most important water quality problems in South Africa. Write a mini-essay describing what they are, what causes them and their effects on the environment.

Eutrophication

- is the addition of high levels of nutrients especially nitrogen and phosphorus to water.
- It is caused by allowing untreated sewage to flow into rivers or wetlands - Also when fertilisers get washed into rivers, streams.
- or when fertiliser industries pour waste into rivers, streams
- The extra nutrients allow the algae and other aquatic plants to grow
- and reproduce very quickly and cover the surface of the water.
- The rapid growth of algae is called an algal bloom.
- Certain algae in algal blooms can release toxins into the water - that are harmful to humans and other animals.
- The algae become overcrowded and eventually they die
- due to a lack of sunlight.
- Bacteria in the water decompose the dead plant material.
- The bacteria use up a lot of the oxygen in the water during decomposition - As a result, aquatic animals e.g. fish insects etc. die
- due to a lack of oxygen.

Acid Mine Drainage (AMD)

- is the drainage of highly acidic water from mines onto the surface of the land or into groundwater.
- Acid mine water is formed when groundwater flows over the rocks in old mine shafts and tunnels in gold and coal mines.
- The water dissolves sulphide minerals out of the rocks
- which form sulphuric acid.
- The sulphuric acid lowers the pH of the water.
- The sulphuric acid in turn dissolves metals out of the rocks.
- These metals include toxic heavy metals such as manganese, and radioactive practices.
- Radium and uranium are radioactive elements which release radiation
- into the environment, which is very harmful to living organisms.
- Acid mine water gradually fills up old mines and rises to the surface
- where it spreads out and pollutes rivers and wetlands and harms or kills plants and animals
- that are in contact with the water
- It also moves into underground water supplies
- which may be used for irrigation or drinking and will therefore harm plants and animals in this way too.

HYPOTHALAMUS (THERMOREGULATION) ESSAY

A marathon runner took only 1 litre of water with him when he set off on a race on a hot day. Describe the changes in his body to try to maintain normal body temperature. Describe the role of the hypothalamus in regulating the water balance of his body

Thermoregulation

- When environmental temperature is high
- Receptors in the skin detects this
- Impulses are send to the Hypothalamus
- Which sent impulses to the blood vessels in the skin
- These blood vessels become wider/dilate/increase in diameter/vasodilation
- More blood flows through the skin
- More heat is therefore lost
- from the body - Through radiation
- The sweat glands
- Produce more sweat
- That evaporates from the skin's surface
- Leading to more heat is lost
- Cooling down the body

Hypothalamus

- will respond to information received from osmoreceptors
- To release more ADH into the blood
- Higher concentration of ADH increases the permeability
- of the renal tubules/distal convoluted and collecting tubules
- Allowing more water to be reabsorbed from the filtrate
- Passing into the surrounding blood capillaries
- Increasing the quantity of water in the blood
- Less urine will be excreted/more concentrated

BREATHING ESSAY

Describe the mechanism of the breathing process and explain how the correct level of respiratory gases are restored soon after running a 100 m sprint,

Mechanism of breathing process

- **Inhalation (Inspiration)**
- Diaphragm contracts and becomes less convex
- Abdominal muscles relax
- External intercostals muscle contract
- internal intercostal muscle relaxes
- Ribs are raised upwards and outwards
- Thoracic cavity enlarges in volume
- and pressure in lungs decreases
- Air flows through the air passages into lungs
- Lungs expand

- **Exhalation (Expiration)**
- Diaphragm relaxes and return to its convex dome-shaped position
- External intercostals muscles relax
- and internal intercostals contract
- Ribs and sternum move inwards and downwards
- Volume of thoracic cavity decreases
- Pressure inside thoracic cavity increases
- Pressure on lungs increases and
- air rich in carbon dioxide is forced out of lungs
- through the air passages into atmosphere

Homeostatic control of carbon dioxide and oxygen

- When the carbon dioxide concentration in the blood increases
- it is detected by the sensory cells (pH receptors) in the walls of the aorta near the heart and brain
- and at the base of the carotid arteries and
- afferent sensory impulses are transmitted
- to the respiratory control centre in the medulla oblongata
- and the cardio-vascular centre
- from where efferent impulses are transmitted to the diaphragm
- and external inter-costal muscles
- which contract more actively to increase the rate and depth of breathing
- as a result, more oxygen is inhaled And
- more carbon dioxide is exhaled
- the cardiac muscles contract faster (heart beat rate increases)
- and the carbon dioxide containing blood is pumped faster to lungs
- and oxygen containing blood faster to the tissue cells
- the peripheral arterioles contract
- so that the blood flows faster through the tissues

- when the carbon dioxide concentration decreases the process slows down.

STEM CELL ESSAY

Stem cell research has made a significant contribution to the medical field. Evaluate this statement by describing what are stems cells, where they are harvested, their uses and the ethical issues associated with them

What stem cells are

- Undifferentiated cells
- that have the ability to form any cell or tissue
- in the body

Where stem cells are harvested from

- Stems cells from embryonic tissue -
- Stems cells from foetal tissue

Uses of stem cells

- Replace neurons damaged by injuries to the spinal cord
- - Produce insulin that could treat people with diabetes
- Replace heart muscle cells
- that could repair damage after a heart attack
- Portion of bone marrow collected
- Bone marrow transplants

Arguments for stem cell research

- Embryos only small amounts of undifferentiated
- tissue - Embryos will be destroyed anyway
- Stems cells harvested from cord blood
- does not destroy the embryo

Arguments against stem cell research

- Using stem cells for research, embryos are living organisms
- unacceptable to destroy them
- Destruction of embryos is immoral.
- against moral and religious Beliefs.

GLUCOSE REGULATION ESSAY

Write a short essay to explain the homeostatic control of glucose in the human body. Briefly discuss the symptoms and management of the resultant chronic conditions that develop due to a dysfunctional system.

Homeostasis

- is the ability of a living organism to maintain a constant internal environment
- irrespective of changes in the external environment e.g. ability to maintain constant (correct level) glucose concentration level of the blood.
- Two hormones, insulin and glucagon,
- secreted by the islets of Langerhans
- in the pancreas control the concentration of glucose level of the blood. When the blood sugar level is higher
- than normal, the hormone insulin is secreted.

The release of hormone insulin reduces the level of glucose in two ways.

- Firstly, it increases the rate at which glucose is absorbed
- by the cells of the liver and muscles.
- Secondly, it stimulates the conversion of glucose into glycogen
- and fat in the liver and muscles.

When the blood sugar level is lower than normal,

- the hormone glucagon is secreted.
- The hormone glucagon stimulates the conversion of stored glycogen
- in the liver, into glucose.
- This glucose is released into the blood in order to raise the level of glucose back to normal level.
- When insulin is not secreted in the body the glucose level of the blood rises.
- This condition is known as **diabetes mellitus**.
- The kidney excretes some of the glucose in the urine.

There are two types of diabetes mellitus.

- Type 1 diabetes occurs when the pancreas stops producing insulin.
- People who have Type 1 diabetes must inject insulin to survive.
- Type 2 diabetes is caused by the secretion of insufficient quantity of insulin.
- This condition can be treated successfully without medication
- by making certain adjustments in the diet. T

The symptoms of diabetes mellitus are

- presence of glucose in the urine,
- extreme thirst, nausea/vomiting,
- weight loss, fatigue, non-healing wounds
- and frequent urination.

The treatment and management of this condition include

- regular exercise,

- following a prescribed diet
- and using prescribed medication

NEPHRON HOMEOSTATIC CONTROL ESSAY

Write a short essay describing the homeostatic functioning of the nephron if a person consumes excessive amounts of water in a short period of time.

- **The effect of drinking** a lot of liquid will be to make the blood and body fluids more dilute than usual.
- When the water content of the body is above normal
- the osmotic potential of the blood decreases
- which signals osmoreceptors in the hypothalamus
- that produces ADH
- to transmit impulses to the hypophysis to release less ADH in to the blood
- Therefore, less ADH reaches the kidney and causes a decrease in the permeability of the walls of the
- distal convoluted tubule and collecting duct
- less water is reabsorbed from the filtrate
- and a large amount of diluted urine is excreted
- The adrenal glands secrete less aldosterone
- which causes less sodium ions to be actively pumped out of the filtrate
- in the ascending limb of loop of Henle
- Into the tissue fluid of the kidney medulla
- This creates a high-water potential or less negative osmotic potential
- Therefore, less water is reabsorbed
- from the nephron tubule into the tissue fluid of the medulla
- That means more water will be excreted as urine.

DIGESTION AND ABSORPTION ESSAY

Describe the digestion and absorption of food that contains only carbohydrates. Also, describe the transport of the products of carbohydrate digestion, following their absorption.

Digestion

- Carbohydrates are broken down to smaller size by teeth
- and the stomach churns/ mixes the food
- to become a liquid which is known as chyme.
- Carbohydrases/ amylase in the saliva,
- in the pancreatic juice and intestinal juice
- break down the polysaccharides (starch)
- to disaccharides and eventually to monosaccharides (or examples)
- in an alkaline medium

Absorption

- Glucose in small intestine moves
- and by active transport which requires energy
- and by diffusion passive/ no energy required
- through the columnar epithelial cells
- into the blood capillaries
- of the villus.

Transportation

- The blood capillaries in the villi join together
- and eventually form the hepatic portal vein
- This blood vessel carries the product to the liver
- Processed nutrients, leave the liver in the hepatic veins
- The hepatic veins join up with the inferior vena cava
- that takes the blood to the heart
- The heart then will pump the nutrient-rich blood to the whole body/cells/tissues via the aorta

HEARING AND REFLEX ACTION ESSAY

Explain how a person hears the sound of a dog growling and is able to respond rapidly to the touch of its nose on his or her leg

Content: 17
Synthesis: 3

HEARING

- When the person hears the sound of a dog growling,
- The pinna traps and directs the sound waves into the auditory canal
- The sound waves strike the tympanic membrane (eardrum) and cause it to vibrate.
- The vibrating membrane causes the ossicles, including the stirrup (stapes), to vibrate
- This sets up waves in the perilymph and endolymph
- The organ of Corti in the cochlea becomes stimulated
- The stimulus is converted to a nerve
 - The nerve impulse is carried by the auditory nerve to the cerebrum where the sound is interpreted
 - The pressure in the cochlea is then eased out through the round window into the Eustacian tube

REFLEX ACTION

- Reflex action may be defined as a rapid, automatic response to a stimulus received by an organ, in this case, the leg
- When the dog's nose touches the leg
- Receptors in the skin receive the stimulus
- The stimulus is converted into a nerve impulse
- The impulse travels along the sensory neuron
- towards the spinal cord along the dorsal root
- of the spinal nerve
- In the spinal cord, the sensory neuron makes synaptic contact with the connector
- and then the impulses are **transmitted** along the motor neuron along the ventral root of the spinal nerve to the effector organ/muscle which contracts and pulls the leg away

LAMARCKISM AND DARWINISM ESSAY

Charles Darwin and Jean Baptiste de Lamarck had different ideas to explain evolution. Describe how each of them would have explained the evolution of the long necks of giraffes. Justify whose idea is more acceptable in the science community today.

Charles Darwin explanation

- As a result of genetic variation✓ / some giraffes have longer necks than others✓
- Environmental change✓ / when the leaves became scarce in short trees
- competition for resources occurred✓
- causing those with shorter necks to die✓
- and those with longer necks to survive✓
- This is natural selection✓ / survival of the fittest
- The genes✓ / genotype for longer necks
- were passed on to subsequent generations✓
- as a result now the population of giraffe have long necks✓

max

Jean Baptiste de Lamarck explanation

- All giraffes had short necks✓ originally
- When the leaves became scarce in short trees✓ / lower parts of trees
- Giraffes stretched✓ / used their neck more often to reach to the taller trees
- As a result the neck became longer✓ / developed
- This acquired characteristic ✓ was passed on to the offspring✓
- The next generation of giraffes had long necks✓

Max

An idea accepted in the science community today

Charles Darwin✓ - there is evidence✓ that genes are inherited from the parents,✓ and is not the acquired characteristics✓

Max

STEM CELL ESSAY II

Describe TWO types of stem cell therapy and for each type, explain TWO advantages and TWO disadvantages of the process

EMBRYONIC STEM CELL THERAPY

The use of stem cells which can be extracted from the human foetus or the umbilical cord of the foetus to allow for the development of other types of cells / organs which may be required by the body

Max (2)

ADVANTAGE OF EMBRYONIC STEM CELL THERAPY:

Medical benefits in the field of therapeutic cloning / regenerative medicine

Discovery for treatments and cures for many diseases

Limbs/organs formed in the labs from stem cells can be used in transplants/ help treat illnesses

Transplant of cells done quickly with the minimal amount of invasion

Cells can differentiate into any type of cell / tissue / organ

Cells can be cultured relatively easily under lab conditions to produce a large number of the required type of cells

(Any other suitable answer) Any 2 x 2 = (4)

DISADVANTAGE OF EMBRYONIC STEM CELL THERAPY: 18:38

The use of embryonic stem cells involves destruction of blastocyst which is unacceptable / immoral

Long term effects of such an interference with nature is unknown embryonic stem cells derived from embryos are not a patient's own and the body may reject them

Fertilization of embryo is done in vitro and then donated for research which is questionable

They may only be available for those individuals who can afford the treatment as it is expensive

(Any other suitable answer) Any 2 x 2 = (4)

ADULT STEM CELL THERAPY:

Undifferentiated cells among differentiated cells in tissues or organs that can renew itself to yield some or all of the major specialized cell types of tissues or organs

Max (2)

ADVANTAGE OF ADULT STEM CELL THERAPY: 18:38

Adult stem cells are able to generate new cells

They can be cultured to produce larger quantities of cells therefore able to treat injury or diseases

Your own cells are used therefore there will be no rejection by the body

(Any other suitable answer) 2 x 2 = (4)

DISADVANTAGE OF ADULT STEM CELL THERAPY:

Only a small number of stem cells can be removed therefore, generating a large quantity of cells will be difficult

Differentiation of cell type is limited to the type of cells of origin therefore no

New type of cells can be differentiated

Undifferentiated cells are rare in mature tissue therefore to isolate these cells will be a difficult (a challenge)

Cells are pre - specialised therefore only specific types of cells will be made e.g.

Blood stem cells will only make blood

MEIOSIS AND DNA REPLICATION ESSAY II

DESCRIBE THE SIGNIFICANCE OF DNA REPLICATION AND MEIOSIS IN FERTILISATION, AND HOW THE RESULTING FOETUS IS PROTECTED AND NOURISHED IN THE UTERUS

**Content: 17
Synthesis: 3**

THE SIGNIFICANCE OF DNA REPLICATION

Since DNA replication occurs just before cell division, it allows for a doubling of genetic material. This is to ensure that sufficient genetic material is available to form 4 haploid gametes from one diploid cell.

SIGNIFICANCE OF MEIOSIS

18:39

Meiosis leads to exchange of genetic material and adds to genetic variation. The reduction of chromosome number to haploid number keeps the chromosomes number constant from generation to generation. Meiosis forms four haploid cells, which function as gametes. Independent assortment adds to genetic variation

PROTECTION OF FOETUS

The foetus is protected from injury as well as against temperature changes by the amniotic fluid.

NOURISHMENT OF THE FOETUS

The foetus received nutrition via the placenta. Nutrients and compounds from the maternal blood pass into the foetal blood. These substances reach the foetus via the umbilical vein

REPRODUCTIVE STRATEGIES ESSAY

Vertebrates have developed many strategies to ensure the success of reproduction and the survival of the offspring. In an essay, discuss the **DIFFERENT REPRODUCTIVE STRATEGIES**. Discuss how the different **METHODS OF FERTILISATION** and **EMBRYO DEVELOPMENT** contribute to the success of each strategy. Provide **ADVANTAGES AND DISADVANTAGES** for each method and provide **EXAMPLES** where possible. Any 17 Facts: (17) + Synthesis: (3)

METHODS OF FERTILISATION

There are two methods of fertilization and these are External Fertilisation and Internal Fertilisation

External Fertilisation

15/14/0

During external fertilisation, the sperm cell fertilises the egg outside the body of the female. The disadvantage there is less control over the fertilisation process. To overcome this, large numbers of male and female gametes (sex cells) are produced which requires more energy to be used. Water is necessary to allow for the motility of the male gamete and to prevent the dehydration of the gametes. Another disadvantage is that there is an increased chance of the gametes being eaten by predators. An advantage is that there is, however no need for a copulatory organ to deposit the male gametes. (Examples are frogs and fish)

Internal Fertilisation

18:40

During internal fertilisation, the male deposits its sperm cell inside the reproductive organs of the female. The advantage of this is that it is more controlled, which increases the chances of fertilisation. Another advantage is that both gametes are protected within the body of the adult and the embryo develops in a protected environment. (Examples are birds and mammals)

(Max 6)

DIFFERENT REPRODUCTIVE STRATEGIES

There are three different reproductive strategies: ovipary, vivipary and ovovivipary.

OVIPARY

With ovipary, the embryo develops outside the body of the female. The advantage of this is that large numbers of eggs are laid. The disadvantage is that the embryo has a small amount of protection and predators may prey on the eggs. Another disadvantage is that very few eggs become fertilised and fewer still survive to hatching. There is also a greater chance of succumbing to climatic conditions. Examples are frogs, birds and reptiles. (oviparous – giving birth by egg)

VIVIPARY

With vivipary, the young develop inside the uterus of the mother after the eggs are fertilised internally. The advantage is that the embryo is more protected and is provided with nourishment. For example, the placenta in mammals provides the developing embryo with nutrients. Waste products are removed and the body of the female provides gaseous exchange. Another advantage is that the internal fertilisation increases the chances of offspring being produced and surviving. Examples are humans, mice and elephants (viviparous, giving live birth)

OVOVIVIPARY

With ovovivipary, the development of a fertilised egg is retained (kept) in the mother's body. The advantage is that the developing young obtain nutrients from the yolk of the egg. The young hatch within the mother's body and are then born.

Ovovivipary occurs in some insects, some fish and some reptiles. Specific examples are the puff adder, Cape chameleon. (ovo+vivi+parity (a noun), egg-live-birthing) (Max 6)

TYPE OF EMBRYO DEVELOPMENT AND PARENTAL CARE

There are two different types of embryo development, which are precocial and altricial

PRECOCIAL DEVELOPMENT

Precocial development allows the new offspring a greater chance at survival, since they are born ready to fend for themselves. It also reduces the need for a high degree of parental care. Although it is mostly the lower order vertebrates (fish, amphibians and reptiles) that display precocial development, many mammals and birds may also display precocial development, for example, giraffes, ground birds, turkeys and quails.

ALTRICIAL DEVELOPMENT

Altricial development necessitates a higher degree of parental care, since the new offspring are unable to fend for themselves. Examples of altricial development are prevalent amongst humans and some birds.
(Max 5)

THREAT TO BIODIVERSITY ESSAY

The greatest threat to biodiversity is the destruction of habitats. Describe how various human activities may lead to habitat loss.

Content: 17

Synthesis: 3

URBANISATION – land is cleared for housing, industries and roads leading to habitat fragmentation which eventually lead to a decrease in genetic diversity causing populations to become extinct

POOR FARMING METHODS – monoculture allows only a few species of animals to survive, losing a large amount of plants and animals which would have been present if the crops were varied

OVERGRAZING of land leads to loss of topsoil/erosion decreasing soil fertility

USE OF PESTICIDES which kills secondary consumers and fertilisers which when washed to rivers disturbs the ecosystem of the river leading to extinction of some populations 17:25

GOLF ESTATES require plenty of water and vast clearance of vegetation to make way for the lawn, in which only a few species will exist

MINING results in degradation of ground water as well as a change in the pH of the water around the area, emission of toxic gases into the atmosphere and also causes soil erosion. The environment is altered in such a way that organisms can no longer exist in the area

DEFORESTATION – the demand for wood products cause many trees to be cleared, this destroys the ecosystems within the forest area leading to extinction of some populations.

DESTRUCTION OF WETLANDS AND GRASSLANDS – these areas have been cleared for human habitation reducing the biodiversity of organisms surviving entirely on wetlands or grasslands

HOMEOSTASIS ESSAY

“Homeostasis is the maintenance of a constant internal environment, within narrow limits, despite a changing external environment.”

Nomsa is sitting in class on a particular day and looks at the wall thermometer showing 43°C.

Discuss the processes and mechanisms that are involved in thermoregulation and osmoregulation in her body on that particular day.

Content: 17

Synthesis : 3

THERMOREGULATION

- When the environmental temperature is high, receptors in the skin detect this
- increased blood temperature is detected by the heat loss centre of the hypothalamus.
- The hypothalamus sends impulses to the skin causing the surface blood vessels to dilate/increase in diameter/vasodilation occurs.
- More blood flows to the skin and therefore more heat is lost to the environment.

The sweat glands are stimulated to produce more sweat thereby causing heat loss through evaporation

- Thereby causing the body to cool down

Any 8

OSMOREGULATION

- On a hot day a person loses water through sweating, thereby decreasing the amount of water in the blood.
- Osmoreceptors detect this and cause the hypothalamus to release more ADH (Antidiuretic hormone) into the blood.
- ADH cause an increase in the permeability of the renal tubules to water
- More water is reabsorbed in the kidneys
- Urine becomes more concentrated/decrease in volume
- Water levels are restored to normal

Any 9

BLOOD GROUPS ESSAY

Sandy has given birth to a baby girl. There are two men claiming to be the father of the child. Explain how the inheritance of blood groups and DNA testing could assist in establishing who the father is.

Content 17
Synthesis3

- Blood groups are controlled by three alleles I^A , I^B , i which in combination will provide four different phenotypes namely blood groups A, B, O and AB.
- An individual with blood group A, will inherit one allele from each parent and will therefore inherit a genotype of either $I^A i$ or $I^A I^A$ from his parents
- An individual with Blood group B will inherit one allele from each parent and will therefore inherit genotype of either $I^B i$ or $I^B I^B$; and
- An individual with blood group AB will inherit one allele from each parent and will have both alleles I^A and I^B which are co - dominant, and
- An individual with blood group O will inherit i allele from both parents and will be homozygous recessive (ii)
- The blood of each male as well as the baby's blood must be tested.

- If the baby's blood group is O, then the father with blood group AB will be eliminated as he does not carry the recessive O(i) allele.
- Should the father have a blood group B with a IBIB genotype, then he will be eliminated as a potential father as he does not have the recessive O(i) allele.
- Should the father have a blood group A with a IAIA (homozygous) genotype, then he will be eliminated as a potential father as he does not have the recessive O(i) allele.
- The father who also has a blood group B but a genotype of IBi (Heterozygous), could be a possible father as he is carrying the i allele of which the baby inherited.
- If the father who has a blood group A with a genotype of IAi, could be a possible father as he is carrying the i allele of which the baby inherited. (any 12)

DNA testing can further confirm the father of the child by analysing and comparing the DNA genetic bands of each potential male parent with the genetic bands of DNA taken from the baby.

Should there be more genetic bands that are identical to that of the baby then that would confirm the male parent/father. (any 5)

SPECIATION ESSAY

Briefly explain how geographic isolation of a common ancestral species of finches has led to the development of 14 different species of finches on the Galapagos Islands

The Galapagos consists of a group of 13 main islands, 6 smaller islands, and 107 rocks and islets√. These islands are found in the eastern Pacific Ocean. 973 km off the west coast of Ecuador in South America √

Scientists think that a few million years ago, one species of finch√ with a variety of beak types√, migrated to the Galapagos Islands' from the mainland of Central or South America √ This species then spread across the many islands√.

The different populations were unable to mix and reproduce because they occurred on different islands√. Climatic conditions on the islands changed from year to year dramatically altering the food supply√ The food supplies on each island did not change in the same way√.

On some islands seeds became more abundant; in others there was a good supply of insects. Some of the finches died√ depending on whether the beak structure was adapted for the most abundant food on that particular island.

17:26

In other words, NATURAL SELECTION ✓ occurred independently in each of the islands allowing only those that had beaks that were best adapted for feeding on the available food to survive.

Continued independent nature selection ✓ on the islands has resulted in the formation of a total of 14 types of finches ✓. Three species live on the ground, eating seeds; three species live on cactuses and eat seeds; one lives on trees and eats seeds: and 7 species living on tree eating insects.

Since these 14 types of finches are unable to interbreed now even they are allowed to mix, each type is actually a different species ✓.

Max (17)

The NEW way that examiners assess your essays:

ESSAY ASSESSMENT (SYNTHESIS)

1 mark = RELEVANCE - All information provided is relevant to the topic

1 mark = LOGICAL SEQUENCE - Ideas are arranged in a logical/cause-effect sequence

1 mark = COMPREHENSION - All aspects required by the essay have been sufficiently addressed

PREGNANCY ESSAY

- The zygote divides by mitosis✓
- to form a ball of cells✓
- called the morula✓
- More mitotic divisions of the morula occurs to form a hollow ball of cells✓
- called a blastocyst✓

- The blastocyst attaches to the endometrial lining✓
- The outer wall of the blastocyst, called the chorion✓,
- develops projections called villi✓ which
- embeds/implants✓ into the uterine wall

- The cells of the embryo continues to divide✓
- and differentiate✓
- to form the different organs and limbs✓
- and is now called a foetus✓
- The foetus is enclosed in a sac called the amnion✓
- filled with amniotic fluid✓
- which protects the foetus against temperature fluctuations✓
- protects the foetus against dehydration✓
- and protects the foetus against mechanical injury✓/acts as a shock absorber

- The chorionic villi and the endometrium form the placenta✓
- where the blood of both the foetus and the mother✓
- run close to each other✓
- allowing for nutrients to diffuse✓ into the blood of the foetus
- The umbilical vein✓
- carries the absorbed nutrients from the mother to the foetus✓

HORMONES ESSAY

Name the hormones produced by the testes and ovaries and describe the role of each

Hormone in human reproduction.

Testosterone✓

Produced by seminiferous tubules✓ in the testes

During puberty testosterone stimulates:

- The deepening of the voice as vocal cords elongate in the larynx✓
- The development of muscles✓
- The growth of facial, pubic and body hair✓
- Development of the penis and testes✓
- The production of sperm in the testes✓

max

Oestrogen✓

Produced by the Graafian follicles✓ in the ovaries

- Causes the lining of the uterus✓ /endometrium
- to become thicker/more vascular ✓
- in preparation for a possible implantation of the embryo and development of the fetus✓

During puberty oestrogen stimulates:

- The widening of the pelvis/hips✓
- The growth and development of the breasts✓
- The growth of the female sex organs✓
- The start of the menstrual cycle, ovulation and menstruation✓

max

Progesterone✓

Produced by the corpus luteum✓ and placenta✓

- Progesterone causes further thickening of the endometrium✓
- so that it is ready for implantation of the embryo should fertilisation occur✓
- High levels of progesterone✓
- inhibits the secretion of FSH✓
- by the pituitary gland✓
- which in turn prevents the further development of any new ovum in the ovary✓

max

EVOLUTION ESSAY (LAMARKISM, DARWINISM, GRADUALISM VS PUNCTUATED EQUILIBRIUM)

Evolution according to Lamarck

Lamarck explained evolution using the following two 'laws':

The law of use and disuse: ✓

- As an organism uses a structure or organ more regularly✓, it becomes better developed or enlarged in that organism✓.
- If an organism does not use a structure or organ frequently✓, it becomes less developed or reduced in size and may disappear altogether in that organism✓

The inheritance of acquired characteristics: ✓

- Characteristics developed during the life of an individual✓
- (Acquired characteristics) can be passed on to their offspring. ✓ (Max 5) (5)

Evolution according to Darwin

- Organisms produce a large number of offspring✓
- 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
- there is competition
- Then organisms with characteristics which are more favourable survive✓
- Whilst organisms with less favourable characteristics die✓
- This is called natural selection✓
- The organisms that survive reproduce✓
- And thus pass on the favourable characteristics to their offspring✓
- The next generation will therefore have a higher proportion of individuals with the favourable characteristics✓ (Max 8) (8)

Darwin's ideas about gradualism compared to Punctuated Equilibrium

- Darwin believed that evolution takes place through an
- accumulation of small✓
- gradual changes that occur over a long period of time✓
- supported by transitional forms in fossil record✓
- Punctuated equilibrium suggested that evolution sometimes involves long periods of time where species do not change✓/very little change occurs
- This alternates with short periods of time where rapid changes occur✓
- New species are formed in a short period of time✓/relative to the long period of no/little change
- supported by the absence of transitional forms✓ (Max 4) (4)

Content: (17)
Synthesis: (3)

SPECIATION AND EVOLUTION ESSAY

It is thought that modern humans evolved gradually from ape-like beings over millions of years through speciation.

Describe how a single species can form new species, and explain how the differences in the skulls and other parts of the skeleton of primitive ape-like beings and modern humans support the idea that the general trend in human evolution has been towards bipedalism and a change in diet from raw food to cooked food.

The development of a new species

- If a population splits into two populations✓.
- There is now no gene flow between the two populations. ✓
- Since each population may be exposed to different environmental conditions✓,
- 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 reproduce with each other✓, thus becoming different species (any 5)

The development of bipedalism

- The backward position of the foramen magnum on the skull✓,
- the narrow pelvis✓
- and the less-curved spine✓
- indicates that the ape-like beings were quadrupedal✓ (any 3)
- The forward position of the foramen magnum on the skull✓,
- the wider pelvis✓
- and the curved spine✓
- indicates that modern humans are bipedal✓ (any 3)

Change in the diet from raw food to cooked food

- The large teeth, especially the canines✓
- as well as the large and long jaws✓
- which makes the skull prognathous✓
- as well as cranial/brow ridges associated with large muscles that operate the jaws✓
- indicate that the ape-like beings ate raw food that required a great amount of processing✓/tearing, biting and chewing. (any 3)
- The smaller teeth, including the canines✓
- as well as the smaller jaw size✓
- which makes the skull less prognathous✓
- as well as the absence of cranial/brow ridges due to the presence of smaller muscles for chewing✓
- indicate that modern humans rely on a diet of cooked food that does not require the same amount of processing✓/tearing, biting and chewing. (any 3)

NATURAL SELECTION VS ARTIFICIAL SELECTION ESSAY

One of the observations Darwin made during his study of pigeons was about artificial selection. In 1859 Darwin and Wallace jointly proposed that new species could develop by a process of natural selection.

Using examples, describe natural and artificial selection and also highlight the differences between these two processes.

Natural selection e.g. Finches*✓/or any other example

- Organisms of a particular species shows a great deal of variation✓
 - Some individuals may have characteristics /any example that are favourable✓ /some individuals may be adapted to the environment
 - Others may have characteristics/any example that are unfavourable✓
 - Selective pressure by the environment✓ due to competition✓/changing environmental conditions
 - Organisms with favourable characteristics survive✓ and reproduce✓
 - to pass favourable characteristics to their offspring✓
 - while organisms with unfavourable characteristics will die out✓
 - Over time the whole population will have this favourable trait✓
 - Over time these organisms might develop genotypically and phenotypically independently✓
 - into different species✓ which cannot interbreed
- *Compulsory mark**
Max 7 + 1 for example* (8)

Artificial selection e.g. Production of improved fruit/ meat production*✓

- Organisms of a particular species/any example show a great deal of variation✓
- Humans✓ select organisms
- with a particular desirable characteristic✓
- and interbreed✓ them
- with other organisms that also✓ have the same desirable characteristic
- to improve this characteristic further✓ in the offspring
- They may also choose organisms with different✓ desirable characteristics
- to get offspring with a combination✓ of these desirable characteristics

***Compulsory mark**
Max 4 + 1 for example*

Differences between Natural and Artificial selection (5)

Natural selection	Artificial selection
Selective pressure by the environment✓	Humans select the desirable characteristic✓
Selection is in response to suitability to the environment✓	Selection is in response to satisfying human needs✓
Organisms can survive on their own✓ in the environment (since they were selected on the basis of their suitability to the environment)	Organisms may often not survive on their own✓ in the environment (since they were selected on the basis of human needs and not on suitability to the environment)
No human effort/cost involved✓	Could be labour intensive✓/expensive

any 2x2 (4)

CONTRACEPTIVE METHODS ESSAY (PREG PREVENTION)

Write a mini-essay in which you explain how any THREE contraceptive methods prevent human pregnancy. You should also explain ONE way in which contraception can influence the quality of human life.

Contraceptive methods and the effect on human reproduction

Method	Affect on human reproduction
Condom✓	Acts as a barrier✓/stops sperm getting into the vagina✓
Loop/IUD✓	It prevents fertilised eggs✓/embryos from becoming attached to the uterine wall✓
Femidom✓	Acts as a barrier✓ /stops sperm getting into the uterus✓/Fallopian tubes
Diaphragm✓	It covers the cervical opening✓ and prevents sperm from entering the uterus✓
Contraceptive pill✓	Contains artificially produced hormones✓ which prevents the production of eggs✓/ovulation
Spermicides✓	It contains a chemical substance that kills sperm✓ and acts as a barrier✓/prevents sperm from entering the Fallopian tubes.
Contraceptive injections✓	It contains progesterone✓/combination of oestrogen and progesterone which stops ovulation✓
Male sterilisation✓ - vasectomy	The sperm ducts are cut✓ and tied. Semen without sperm is produced✓
Female sterilisation✓ - tubal ligation	The fallopian tubes are cut✓ and tied during a small surgical operation preventing the fusion of sperm and egg✓
Withdrawal✓	The penis is removed✓ from the vagina before ejaculation✓
Rhythm✓	Sexual intercourse is avoided✓ during ovulation✓

The influence on the quality of human life

Limits family size✓/unwanted pregnancies

- which allows better care for the children✓ higher standard of living✓/ less dependant on debt/ more psychologically stable children

Prevents the transfer of STDs✓

- the use of e.g. condoms can increase life span✓ and decrease✓ the spread of diseases to other people

Might cause conflict✓

- e.g. the use of IUD could be seen by some people as a form of abortion✓ which may not be acceptable to some religions✓

Might promote promiscuity✓

- no danger of falling pregnant✓ and affects the morality✓

AIR POLLUTION ESSAY

Explain SIX strategies to reduce the amount of air pollution entering the atmosphere from human activity.

Strategies to reduce air pollution

- **Introduce legislation**^{✓^S} to force societies to reduce air pollution^{✓^R}/ change behaviour
 - **Monitor emissions from industries**^{✓^S} to ensure that legislation is being followed^{✓^R}
 - **Impose heavy fines**^{✓^S} to discourage repeated acts of pollution^{✓^R}
 - **Implementation of tax**^{✓^S} on CO₂ emissions to encourage the use of smaller cars^{✓^R}
 - **Provide incentives to companies**^{✓^S} /subsidise the purchase and use of clean energy to encourage them to reduce air pollution^{✓^R}
 - **Educate**^{✓^S} people about the ill effects of air pollution so that they behave responsibly^{✓^R}
 - **Research new technologies**^{✓^S} to find more efficient methods of energy production^{✓^R} without releasing greenhouse gases for example solar panels, wind turbines
 - **Increase/improve the use of public transport**^{✓^S} so that fewer people use private vehicles^{✓^R}
 - **More fuel efficient cars/bicycles**^{✓^S} so that less fuel is burnt^{✓^R}
 - **Increasing the efficiency of electricity use**^{✓^S} at home/industries which will decrease the amount of coal burnt^{✓^R} in electricity production
 - **Reduce, re-use and recycle**^{✓^S} to conserve energy^{✓^R} to lower pollution
 - **Switch from fuels**^{✓^S} that produce a lot of greenhouse gases (coal) to those that produces less (natural gas) as alternative energy source^{✓^R}
 - **Preventing deforestation**^{✓^S} /loss of other functioning ecosystems will prevent carbon stored in vegetation of being released in the environment^{✓^R}
 - **Restoring forests**^{✓^S} /wetlands/other ecosystems will remove carbon dioxide from the air because plants absorb carbon dioxide^{✓^R}
 - **Methods to break down**^{✓^S} toxic waste before it is released into the atmosphere^{✓^R}
 - **Regulate smoking/use of fires**^{✓^S} because it produces smoke which contributes^{✓^R} to pollution
 - **More landfill sites for waste material**^{✓^S} instead of using incinerators^{✓^R}
- (Mark any SIX x 2 only and not random points)* maximum 6 x 2

OVERFISHING ESSAY

State FOUR consequences of overfishing to humans and to the environment and explain FOUR management strategies that the government could employ to prevent overfishing.

Consequences of over fishing to humans and the environment

Species can become extinct✓

Loss of biodiversity✓

Fish start to decline✓

Decrease in products using fish✓

People will lose their jobs✓

Shortage of food✓/leading to starvation

Reduced opportunities for ecotourism✓

Upset the balance of ecosystems✓/Food chains/webs can be destroyed

(Mark first FOUR only)

any

Management strategies to prevent overexploitation

Limit the size of fish caught✓only catch those that have already reproduced✓

Limit the number/quotas of fish caught✓to prevent the population from decreasing rapidly✓

Limit the fishing area✓to protect some areas so that the population does not die out✓

Limited fishing /minimal or no fishing ✓during breeding season✓

License to fish✓ to be able to monitor✓

Develop legislation✓to regulate fishing✓/heavy penalties for flouting the legislation

Scientific research✓ to inform legislation✓

Education and awareness✓ of role fish play in the ecosystem✓/endangered species

Encourage mariculture✓for food/prevent extinction✓

Discouraging illegal market✓ by government selling it at lower price✓/subsidy

CONTRACEPTIVES ESSAY (PREVENTION OF STD'S)

Name any FOUR methods of contraception used by men. For EACH method, explain how effective it is and explain its role in the prevention of sexually transmitted diseases.

NATURAL ✓ /Abstinence/behavioural

Completely prevents pregnancy ✓ /has no side-effects
Protects against sexually transmitted diseases (STDs) ✓

NATURAL ✓ /withdrawal ✓
Is not a 100% reliable ✓
Does not protect against STDs ✓

RHYTHM METHOD ✓

Not 100% ✓ /females may ovulate at unpredictable times
does not protect against STDs ✓

CHEMICAL ✓ /Spermicides

On their own, they are not reliable ✓
Does not protect against STDs ✓

MECHANICAL ✓ /Condom

Very reliable ✓
Protects against STDs ✓

SURGICAL ✓ /Vasectomy

Completely prevents pregnancy ✓ /very reliable
Does not protect against STDs ✓

DRINKING WATER QUALITY ESSAY

Explain FOUR management strategies to improve the quality of drinking water. Your description must also include TWO sources of water pollution and TWO effects of water pollution on human health.

Content (12)
Synthesis (3)

Management strategies to improve the quality of water

- Legislation✓ / monitoring of emissions from industries to discourage water pollution✓
- Provide adequate sewage systems✓ so that people do not urinate or pass faeces near a source of water✓
- Provide clean containers to collect water ✓so that pollutants do not contaminate the water✓
- Educate people✓ on the importance of caring for our environment✓
- Reduce the use of pesticides ✓so that less run off to our rivers ✓
- Provide purified✓/safe water to everyone to avoid use of contaminated water✓.
- Conduct research✓ to find ways of reducing pollution✓

(Mark first FOUR only)

(4 x 2) (8)

Sources of water pollution

- Sewage✓
- Waste from factories✓
- Dumping of rubbish/waste✓
- Soap and chemicals entering the water✓

(Mark first TWO only)

(2)

Effects on human physiology and health

- Gastroenteritis✓
- Cancer✓
- Typhoid✓
- Allergies✓
- Cholera✓
- Diarrhoea✓
- Infections/rashes✓

(Mark first TWO only)

Content (2)
(12)

GONORRHEA AND HIV/AIDS ESSAY

Gonorrhoea and HIV/Aids are common sexually transmitted diseases (STDs) which infect a relatively high percentage of young sexually-active people worldwide.

Write a mini-essay in which you state the causes, THREE symptoms and the possible treatment and prevention for each of these STDs.

Causes:

Gonorrhoea

Bacterium✓

AIDS

HIV✓

Symptoms:

Gonorrhoea

- Pain or burning when passing urine✓
 - Abnormal discharge from the genital openings✓
 - Inflammation of the testicles✓
 - Sores✓
 - Painful/swollen joints✓
- (Mark first THREE only)**

AIDS

- Flu✓ like symptoms in early stages
 - Failure of the immune system✓ which results in
 - e.g. fungal infection of the lungs✓/any other correct disease
 - Weight loss✓
 - Sores✓
- (Mark first THREE only)** (any)

Possible treatment:

Gonorrhoea

Antibiotics✓/ Penicillin

AIDS

No cure✓/Anti-retroviral treatment slows down the progression/ARV's/
nutrition

Prevention:

- Abstain✓ from sexual activity/promiscuous behaviour
 - Use of condoms✓ can reduce the risks of STDs
 - Be faithful to your partner✓
 - Cautious handling of body fluids✓
 - Know your status✓
- (any)

OVER-EXPLOITATION OF INDIGENEOUS PLANTS ESSAY

Write a mini-essay in which you describe at least FOUR ways in which over-exploitation of indigenous plants impacts on the environment. Explain FOUR appropriate management strategies that can reduce such over-exploitation.

Impact on environment

- Plants can become extinct✓/lead to loss in biodiversity
 - Food chains/webs can be destroyed✓
 - Shortage of food✓
 - Could lead to degradation of the environment✓
 - Erosion of ground surface if too many plants are removed✓
 - Increase run-off of water✓
 - Destroy habitats of many organisms✓
 - Alien plant invasion✓
 - Upset the balance of oxygen and carbon dioxide✓/global warming
- any (4)

Management practices to reduce over-exploitation

- Sustainable harvesting✓ – over-exploitation must not be allowed✓
 - Research✓ - done to look at reproductive cycle✓/alternative source of active ingredient /cloning
 - Legislation✓ - control harvesting✓
 - Penalties ✓for breaking legislation✓
 - Education✓/campaign - impact and consequences of over-exploitation✓
 - Establish nurseries✓/seed banks - to replace plants harvested✓
 - Establish more nature reserves✓ - to conserve indigenous plants✓
 - Controlling exploitation✓ - of indigenous plants by international companies✓
 - Provision of free✓/cheaper food - to reduce dependence on indigenous plants✓
- any 4 x 2 (8)
(12)

MEIOSIS ESSAY (GENETIC VARIATION, DOWN SYNDROME AND POLYPLOIDY) ESSAY

Describe the mechanisms by which meiosis contributes to genetic variation and describe how abnormal meiosis leads to Down's syndrome and polyploidy. Also describe the advantages of polyploidy in agriculture.

Crossing – over ✓

- Homologous chromosomes ✓ / bivalents pair up
- Each chromosome has 2 chromatids ✓
- Chromatids overlap / cross over ✓
- Points at which crossing-over takes place are referred to as chiasmata ✓
- Genetic material is exchanged ✓ between non-sister chromatids ✓
- After the process of crossing-over chromosomes have genes from its homologous partner ✓
- This means that each gamete formed will have a mix of genes from maternal and paternal parents ✓
- Brings about variation in the gametes ✓ formed and also the offspring **Max**

Random arrangement of chromosomes at the equator ✓

- Each pair of homologous chromosomes ✓ may line up either way on the equator of the spindle ✓
- Independently of what the other pairs are doing ✓ / independent assortment
- This means that gametes will have differing number / mix of maternal and paternal chromosomes ✓ **Max**

Down's syndrome

- In meiosis I ✓ the chromosome pair 21 does not separate ✓ or
- In meiosis II ✓ the chromatids of chromosome 21 do not separate ✓ / centromere does not divide
- Referred to as non-disjunction ✓
- One gamete will have an extra copy of **chromosome number 21** ✓ / two copies of chromosome number 21
- If this gamete fuses with a normal gamete ✓ / gamete with 23 chromosomes
- The resulting zygote will have 3 copies ✓ of chromosome number 21 instead of 2 / zygote has 47 chromosomes leading to Down's syndrome

PUNCTUATED EQUILIBRIUM VS GRADUALISM

GRADUALISM

Based on Geology and the findings of James Hutton and Charles Lyell, gradualism is the idea that large changes are actually the culmination very small changes that build up over time.

This is seen often in geologic processes and when Charles Darwin first began formulating his Theory of Evolution, he adopted this idea for how evolution happens over very long time periods.

The fossil record is a piece of evidence that supports this view. There are many transitional fossils that show structural adaptations of species as they transform into new species. The geologic time scale helps show how the species have changed over the different eras since life began on Earth.

PUNCTUATED EQUILIBRIUM

The other generally accepted hypothesis for the rate of evolution is called punctuated equilibrium.

Punctuated equilibrium is based on the idea that we cannot see changes in a species, so there must be very long periods of no changes of species. That is the equilibrium part of punctuated equilibrium.

However, we do know that species do change, so there has to be a period of time where those changes occur.

Punctuated equilibrium asserts these changes over a relatively short amount of time "punctuating" the long periods of equilibrium.

GENETIC VARIATION AND MUTATION ESSAY

Describe how POINT MUTATIONS, FRAMESHIFT MUTATIONS and MEIOSIS contribute to Genetic Variation

GENE MUTATIONS

Gene mutations are errors (or mistakes or changes) that may occur during transcription and/or DNA replication

- POINT MUTATIONS: replacing/substituting one base of a codon with another
- Small change that may possibly result in one amino acid changing in a protein

- FRAME-SHIFT MUTATIONS: addition/deletion of one or more bases of a code
- Resulting in changing the order/sequence of all the bases of the codons
- Resulting in forming a different protein with different functions
- Lead to different phenotypes

MEIOSIS

CROSSING-OVER

- Homologous chromosomes/bivalents pair up
- Each chromosome has 2 chromatids
- Non-sister chromatids overlap/cross over
- Points at which crossing-over takes place are referred to as chiasmata
- Genetic material is exchanged between non-sister chromatids
- After the process of crossing-over chromosomes have alleles from its homologous partner
- This means that each gamete formed will have a mix of alleles from both parents
- Brings about variation in the gametes formed and also the offspring

RANDOM ARRANGEMENT OF CHROMOSOMES AT THE EQUATOR

- Each pair of homologous chromosomes may line up either way up on the equator of the spindle
- Independently of what the other pairs are doing
- This means that gametes will have differing number/mix of both parental chromosomes

FOETUS ESSAY

An unicellular zygote undergoes many developmental changes until it becomes a multicellular foetus, nourished and protected by the mother.

Describe the changes that allow the ZYGOTE TO EVENTUALLY DEVELOP INTO A FOETUS and how the FOETUS IS NOURISHED AND PROTECTED DURING THE PERIOD OF PREGNANCY.

DEVELOPMENT OF AN UNICELLULAR ZYGOTE

Just after the fertilisation, a zygote is formed. The zygote passes down the fallopian tube and undergoes cell division by mitosis.

The zygote develops into a ball of cells called morula and thereafter it becomes a blastocyte (blastocyst). In the uterus it will further divide by mitosis and form an embryo, which becomes attached to the endometrium wall of the uterus. This is called implantation. During this time two membranes develop around it.

They are called extra-embryonic membranes. The membranes are the chorion which form the chorionic villi and the amnion. After 12 weeks, the embryo is called a foetus.

NOURISHMENT OF THE FOETUS

The foetus is nourished by the mother through the placenta. Nutrients and compounds from the maternal blood pass into the foetal blood. These substances feed the foetus via the umbilical vein

PROTECTION OF THE FOETUS

The foetus is protected by the amnion filled with an amniotic fluid which prevents temperature changes as well as against injury – it acts as a shock absorber.

SKULL ESSAY

(F = a tick)

Describe the structural changes to the skull that characterise the evolution of modern humans from their ape-like ancestors, and explain the significance of these changes.

Foramen magnum

- The foramen magnum was in a backward position in the ape-like beings^F but in a forward/ central/ ventral position in modern humans^F

Significance

- This represents a change from quadrupedalism in ape-like beings^S
- To bipedalism/(walking upright) in modern humans^S, leading to the following in modern humans:
 - Increased awareness of the environment^S in sensing danger/food
 - Freeing of the hands to use implements^S/ carry objects/ weapons/ offspring
 - Exposure of a large surface area for thermoregulation^S/losing body heat to surroundings in hot conditions/reducing overheating
 - Display of sex organs /breasts as part of courtship behaviour^S

Cranium

- Modern humans have a larger cranium^F than the ape-like beings^F
- Modern humans have a less sloping forehead^F than the ape-like beings^F
- Modern humans have a cranium that is more rounded^F than the ape-like beings^F

Significance

- This allowed space for a larger brain^S in humans than in ape-like beings^S, making the following possible:
 - o Better co-ordination of movement^S
 - o Processing of a large amount of information^S
 - o Processing information faster^S
 - o Development of spoken and written languages to communicate^S

Jaws

- Humans have smaller jaws than the ape-like beings
- Humans have jaws that are non-prognathous/ flat face compared to the jaws of ape-like beings which are prognathous/sloping face
- Humans have C-shaped jaws/jaws that are gently curved compared to the U shaped jaws in the ape-like beings

Significance

- This corresponds with a change in diet from hard, raw food in the ape-like beings
- To softer, cooked food in humans

Dentition/Teeth

- In ape-like beings there are gaps/diastema between incisors and canines
- but no gaps between the teeth in humans
- Humans have smaller teeth/incisors and canines than the ape-like beings
- Humans have flatter molars and pre-molars than the ape-like beings

Significance

- 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

Eyebrow ridges

- Humans have eyebrow ridges that are smaller than those of the ape-like beings

Significance

- There is a decreased need to strengthen the skulls of humans due to the smaller size of the jaws

Chin

- In humans the chin is more developed compared to the ape-like beings

Significance

- Developed chin assists with speech in humans (space in mouth for movement of tongue for the development of complicated language)

Zygomatic arch

- In humans the zygomatic arch/cheek bone is less developed than in the ape-like beings

Significance

- This corresponds with the decreased need for attachment of strong muscles due to the decreased jaw size in humans. Also, jaw muscles not as big and strong which indicates omnivorous diet. They eat more refined food (cooked meat and vegetables)

GENETIC ENGINEERING ESSAY

Write a mini essay on genetic modification of crops, explaining what genetic modification is. Discuss FOUR advantages, FOUR disadvantages opposition to genetic modification of food

GENETICALLY MODIFICATION is 'the introduction of new genes into a living organism in order to produce desired characteristics and eliminate undesirable traits

ADVANTAGES OF GENETIC MODIFICATION

Improve taste and the nutritional value

Become resistant to drought, cold, heat or alkaline conditions.

Enable plants to grow healthier, larger and to become mature quicker than the ordinary plants (increased growth rate)

To increase the shelf-life of fresh produce.

Achieve higher yields from limited resources.

Increase resistance to diseases.

Obtain more predictable results'

Provide resistance to herbicides and pesticides.

To give ability to survive in nitrogen poor soils'

To develop frost resistance crops.

To develop resistance to natural pests.

Enable crops to grow in any season of the year.

To manufacture specific drugs or vitamins for human consumption.

DISADVANTAGES OF GENETIC MODIFICATION

Genetically modified crops:

Can be costly as it involves modern biotechnology which requires highly skilled people and sophisticated and expensive equipment

May cause allergic reactions in humans.

Could reduce biodiversity in a specific habitat.

Can easily be destroyed by new diseases.

Can interbreed with wild plants and spread to future generation.

May include a pesticide resistant gene that spread to wildlife with bad results.

CLONING ESSAY

Clones are a group of Genetically Identical Organisms. Explain THREE advantages and THREE disadvantages with reasons of cloning

Content: (17)

Synthesis: (3)

from LIFE SCIENCE ACADEMICS - 2015

CLONING allows an individual animal or plant with desirable features, (eg such as a cow that produces a lot of milk or to increase the yield of fruit), to be duplicated several times (1)

ADVANTAGES OF CLONING

Producing individuals with desired traits eliminate unwanted characteristics

Better yield to increase the amount of food for a large population

Resistant to diseases to save on the use of pesticides and herbicides

Organisms produced in a shorter time to increase yield

Saving endangered species then there is no need for mating partners or looking for partners

Producing body parts reducing rejection of transplanted parts

Produce offspring for organisms that are infertile and cannot have their own offspring

Reproduction is not seasonally dependent

(4 x 2) (8)

DISADVANTAGES OF CLONING

Reducing the gene pool by reducing variation/reduces genetic diversity

Cloned organisms may have developmental/morphological problems and not survive long

Costly process not all farmers/people/government's can afford it

May generate more experimental waste causing ethical issues around disposal of waste

May lead to the killing of clones to obtain spare body parts

Objection/religious beliefs to interfering with God's/Supreme Being's creation/nature

PHOTOSYNTHESIS ESSAY

Describe the process of photosynthesis from the time light is absorbed until carbohydrates are formed.

The Light Phase*

The Light Phase takes place in the grana •/ thylakoids of the chloroplast•

Light (radiant) energy• is absorbed by chlorophyll molecules• and converted into potential chemical energy•

The energy is used to:

split water•/photolysis into hydrogen•and oxygen•

forms ATP•/ photophosphorylation

Oxygen is released• to the atmosphere and

the energy-rich hydrogen combines with a co-enzyme/NADP•

The Dark Phase•/Calvin Cycle/Light-independent phase

The Dark Phase takes place in the stroma•

Carbon dioxide• from the atmosphere combines• with hydrogen• from the light phase using energy from ATP formed in the light phase• to form carbohydrates•, such as glucose•/fructose/sucrose/starch

Reactions are controlled by enzymes•



CELLULAR RESPIRATION ESSAY.

Describe The Phase Of Cellular Respiration That Releases Carbon Dioxide And How This Gas Is Then Taken To The Lungs And Released Into The Atmosphere

RELEASE OF CO₂ FROM KREBS CYCLE

CO₂ is released during the Kreb's cycle of cellular respiration

Which occurs only if oxygen is present

The pyruvic acid produced during glycolysis enters the mitochondrion where it is used in a cyclic series of reactions

Energised hydrogen atoms and CO₂ are released during these reactions

any (4)



TRANSPORT OF CO₂ THE LUNGS

As it is produced from cellular respiration the CO₂ concentration in the cells increase

This creates a concentration gradient with the blood CO₂ diffuses into the blood

It is transported in the blood in three ways:

1. Dissolved in the plasma
2. Combined with haemoglobin to form carbhaemoglobin
3. Combined with water to form bicarbonate ions

The blood reaching the lungs accumulate CO₂ from other cells along the way

Creating a concentration gradient with the air in the lungs

CO₂ diffuses

through the squamous epithelium

of the alveolus into the lung

any (8)

RELEASE OF CO₂ FROM THE LUNGS

The CO₂ is then exhaled from the lungs

During exhalation the diaphragm relaxes and becomes arched.

The length of the thoracic cavity (i.e. top to bottom distance) is decreased

The external intercostal muscles relax and the rib cage is lowered

This causes the side-to-side and back-to-front distance of the thoracic cavity to decrease

The total volume of the thoracic cavity decreases and pressure on the lung (interpleural pressure) increases

Air rich in carbon dioxide is forced out of the lungs

any (5)

Content (17)

Synthesis (3)

Total (20)

MUTATION ESSAY (HARMFUL AND USEFUL MUTATION)

"Describe how a harmful mutation on DNA may lead to sickle cell anaemia and how useful mutations contribute to natural selection and hence evolution"

FACTS: 17

SYNTHESIS: 3

Sickle cell anaemia is caused by a mutant allele on chromosome number 11

The mutant allele is responsible for the production of haemoglobin S instead of haemoglobin A

Haemoglobin S causes the red blood cells to become sickle shaped

The sickle shaped celled block the small blood vessels and they carry a limited amount of oxygen

The genotypes or genetic codes of individuals (even from the same family) are different from each other because:

- o The gametes produced by meiosis are different from each other
- o There is chance fertilisation of egg cells by sperm cells
- o Mutations also results in new genotypes as we move from one generation to the next

All three of the above ensure that the offspring of the same species show a great deal of variation

Only those individuals that have characteristics that are favourable to enable it to compete successfully for resources in the environment and protect it from other organisms in the environment are able to survive

These organisms reproduce to form offspring who also have the favourable characteristics

Organisms that do not possess these favourable (advantageous) characteristics will die

Charles Darwin called this Natural Selection, implying that Nature selected only those that were the best adapted to the environment to live and reproduce

As Natural Selection occurs from generation to generation, there is a continual, gradual change in populations

Sometimes the populations that results are so different for the earlier populations that they cannot reproduce any more

This leads to SPECIATION (the evolution of new species)

EXCRETION ESSAY

EXCRETION

The THREE main excretory organs of humans are the Lungs, Skin and the Kidneys – we will study the kidneys:

Controlling Body Water

We have two kidneys, which are in your lower back just where your belt goes. Their job is to clean the blood by filtering out unwanted material such as urea, excess water, salt and ions. They are wonderfully constructed organs and do some amazing work.

THE KIDNEY

One job that they are involved in is reabsorbing excess water so that we don't dry out. But how do they do it?

Blood enters the kidney through the renal artery. It is filtered and the 'clean' blood leaves via the renal vein. Any waste material leaves through the ureter, then to the bladder and the world outside!

If you cut into a kidney you see two distinct parts, the dark red outer zone called the cortex and the lighter inner zone, the medulla.

NEPHRONS

If you then use a microscope and look at the cortex you begin to see lots of structures called nephrons. There are about 750,000 of them in each kidney (call it a million!).

ULTRAFILTRATION

At one end is a cup-like structure called the Bowman's capsule. It encloses a knot of capillaries called the glomerulus. These capillaries are leaky and small molecules get filtered out and end up inside the Bowman's capsule. This process is called ultrafiltration.

If nothing else happens then the materials, such as water and urea, will end up going all the way through the nephron, down the ureter, through the bladder and into the toilet!

RE-ABSORPTION

However, sometimes the body needs to grab back chemicals such as water and glucose which are still useful. This happens when they move out of the fluid in the nephron back into the capillary network that twists around the nephron. This process is called re-absorption.

Reabsorption means that the useful chemicals are taken back into the blood out of the nephron. They do not end up in the urine and are not lost from the body

CARRYING CAPACITY, COMPETITION AND PREDATION ESSAY

Discuss the role that carrying capacity, competition and predation play in regulating the size of a population.

Content: 17

Synthesis: 3

Population size is regulated by natality (births), immigration, mortality (deaths) and emigration.

CARRYING CAPACITY

The carrying capacity is the maximum population size that can be supported over a period of time on a particular habitat.

(6)

PREDATION

A predator captures and kills other animals (prey) for its food

Example: Lions that capture and feed on antelopes

Prey population will decrease and the predator population will increase

(3)

COMPETITION

There are two main types of competition, interspecific and intraspecific

INTERSPECIFIC COMPETITION

Interspecific competition happens when large numbers of organisms of different species depend on same resources.

Example: Flour beetles

One species will decrease in population size while the other will increase

(5)

INTRASPECIFIC COMPETITION

Intraspecific competition happens between organisms of SAME species that share the same available resource.

Example: Owls competing for same resources. Stronger owls will survive

The owl population will decrease

(3)

KIDNEY ESSAY

The kidney is mainly responsible for maintaining the balance of water and useful substances in the human body rather than getting rid of it. Write an essay to explain the above mentioned statement with reference to the following:

Glomerular filtration
Tubular reabsorption
Diseases affecting kidney function

GLOMERULAR FILTRATION

Blood in the glomerulus is separated from the capsular space in the Bowman's capsule by two thin cellular layers (glomerular endothelium cells and podocytes), which form an ultra-fine filter for filterable plasma constituents

These include useful substances (e.g. water inorganic substances, glucose, amino acids), waste substances (e.g. urea, uric acid and creatinine) as well as normal blood constituents (blood plasma, proteins, RBC and WBC).

Molecules that can't be filtered are plasma proteins and blood cells. Filterable plasma constituents then move from the glomerulus to the Bowman's capsule because of high blood pressure in the glomerulus and the highly permeable glomerular membrane

TUBULAR RE-ABSORPTION

Useful substances like glucose, amino acids are usually completely reabsorbed in the proximal convoluted tubules through re-absorption

Water is re-absorbed mainly in the medulla of the kidney where the loops of Henle are. Through these processes the kidney is mainly responsible for maintaining the balance of water and useful substances in the human body This is called osmoregulation

DISEASES AFFECTING KIDNEY FUNCTION

- Kidney Stones
- Bilharzia

Kidney stones can form in the ureter leading to a lot of discomfort and pain. The overuse of certain drugs can also lead to kidney failure

Bilharzia is another disease that affects people due to infected water is the bilharzia parasite which can lead to kidney damage

The Treatment of Kidney Failure is either Dialysis or a Kidney transplant

MESSAGE TO THE LIFE SCIENCES LEARNERS FROM FRANCE CHAVANGWANE

I believe that it all begins from a dream, immediately you start dreaming about it, it is the time you start achieving it. This words always keep me going, so to you also start dreaming about what you want to achieve in your life and start working towards your dream. The world that we are now living in it requires education, so you have to value the importance of education. Make sure you become friends with your books and not waste most of your time doing things that won't benefit you in your life.

Know very well that you won't stay at a high school level forever there will be time where you have to leave and face the real world out there. You cannot defeat the world without your powerful spear which is education that can fight the battle for you. Respect and appreciate your teachers because they are trying to shape your future to become a better and an independent individual tomorrow. In my life I believe that everyone was born capable so the way you think it is the way you will do things, that means when you think Life Sciences is a difficult subject to you definitely it will be difficult to you. So you have to change the way you think and develop a positive attitude towards all your subjects for positive results. Associate yourself with people who will add value to your life and encourage you to do good things for good benefits. One of the motivational speakers while I was still doing my matric (Grade 12) told me about the 5Ps and explained the meaning of each P to me which I would like also to share with you. He said that the first P means PROPER, second P means PLANNING, third P means PREVENTS, forth P means POOR and fifth PERFORMACE which in overall meant that Proper planning prevents poor performance that means when you plan/study in time you minimize your chances of performing poorly on your studies.

Avoid studying for exams a night before the actual exam because it will give you depression and cause you to perform poorly because you failed to do the proper planning for your exams. The choice about your life is yours so you know what you want in your life words can be told but at the end you are the one to decide about your life. I just wish you all the best in your studies, you are the future of South Africa. We are all looking forward for a better tomorrow in you so make the country proud of you.

JF CHAVANGWANE



Acknowledgement

I hope by using this document you will gain the necessary skills that are needed when writing a Life Sciences Essay. The document provides a clear structure on how to write the essays. This document has been created from information available from the internet and it is not meant for any business purposes (FREE SUPPLY) but to help South African Life sciences Learners by gathering all the important information together.

Not for market purposes only meant at assisting the Learners with a simple clear alternative in the essay writing, With a compilation of essays from Grade 12-10. You have to read the essays with understanding and never try to memorize them, as that is never part of learning. We aimed at creating independent and innovative thinkers of the south African as non-profit organization.

Sources

1. I'solezwe lesiXhosa, 17 September, 2015 page 11
2. Life Sciences Academics (Facebook page), DR Marian Ross
3. <http://www.testtakingpa.com/study/>
4. South African Department Basic Education Exam question papers and memorandums available from WWW.dbe.gov.za
5. Mr. Chaple's Science Class Blog <http://chaplescienceclass.blogspot.com/2017/09/dna-structure.html>
6. Eastern Cape Department of Education <https://www.ecexams.co.za/ExaminationPapers.htm>

“Education is the most powerful weapon that can be used to change the world” Nelson Mandela

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WITH YOUR
EXAMS AND I
HOPE THIS
DOCUMENT
WILL HELP!
THE END....**

