SOUTH AFRICAN AGENCY FOR SCIENCE AND TECHNOLOGY ADVANCEMENT

60th LIFE SCIENCES OLYMPIAD

GRADES 10 -11

2025

INSTRUCTIONS

Please read the instructions carefully before answering the questions

This is a multiple-choice paper. Please answer all the questions on the answer sheet provided. Each question is followed by answers marked A, B, C, and D. Only one answer is correct. **Choose the correct answer and shade the corresponding circle** on the answer sheet completely, using an **HB pencil.**

NB! The answer sheets are marked electronically – do not make any other dots or marks on the answer sheet. Select only one answer for each question or your answer will be discarded. Ensure that you shade your selection clearly.

Note that the question numbers 1 to 100 on the answer sheet moves **from top to bottom** in several columns. Ensure that the number of your selection on the answer sheet corresponds with the number of the question in your examination paper. Should you make a mistake, please erase the incorrect answer completely

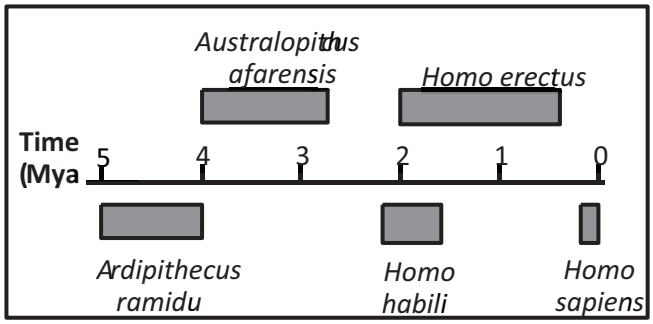
The use of non-programmable electronic calculators is permitted.

To avoid disqualification - You are required to complete all the information requested on the answer sheet. **Please complete the information in script, as well as shade the corresponding blocks**. *If the corresponding blocks are not shaded appropriately, your results will be returned without a name and you will be disqualified*. Do not fold the answer sheets.

Three hours are allowed to answer the questions

Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A to D) next to the question number (1 to 100) in the ANSWER BOOK, for example 101 D.

Questions 1, 2 and 3 refer to the timeline below showing the possible evolution of some hominids.



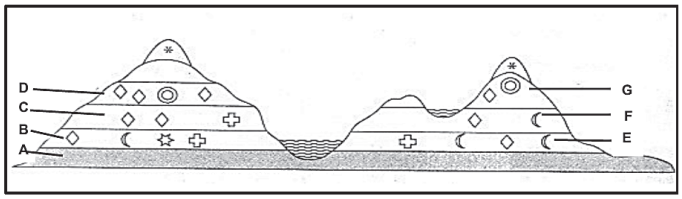
1. *Homo sapiens* is the scientific name for all humans. **The first part of the scientific name Homo, represents the …**
   A. Kingdom name
   B. Species name
   C. Genus name
   D. Family name

2. **Which species inhabited the Earth for the longest time, and how many years ago did this species evolve?**
   A. *Australopethicus afarensis*; 4mya
   B. *Homo erectus*; 2mya
   C. Homo habilis; 2.2mya
   D. Australopithecus ramidus; 5mya

3. **How many genera are represented on the timeline above?**
   A. 5
   B. 1
   C. 3
   D. 2

4. **What is the main purpose of scientific investigations in science? To …**
   A. prove that a hypothesis or theory is correct
   B. disprove a hypothesis or theory
   C. develop and test hypotheses and theories through observation and experimentation
   D. provide absolute answers to scientific investigative questions

5. The following diagram illustrates different layers of rock labelled A to G. The symbols represent different fossils.



Which one of the following is correct for the TWO layers that have the same geological age, with an appropriate reason?

	Layers of Rock	Reason
A	B and E	The fossil species are different
B	B and G	The fossil species are the same
C	D and F	The fossil species are different
D	D and G	The fossil species are the same

6. The functions below are related to organic compounds:

(i) Reserve source of energy
(ii) Reduce heat loss from the skin
(iii) Primary source of energy
(iv) Speed up chemical reactions in the body

The two functions of proteins in humans are:

A. (i) and (ii)
B. (i) and (iv)
C. (iii) and (iv)
D. (ii) and (iii)

7. Which one of the following represents density dependent and density independent factors in an ecosystem?

	Density dependent factors	Density independent factors
A	Disease and competition	Flood and drought
B	Fire and flood	Food supply and predation
C	Food supply and disease	Competition and predation
D	Competition and fire	Flood and drought

8. If the birth rate is 30% and the death rate 10% per year, for every 100 rabbits at the beginning of the year, what will the population be at the end of the year?

A. 70

B. 90

C. 120

D. 110

Questions 9 and 10 refer to the observations made when studying a troop of baboons found on a farm. The observations are tabulated below.

	Males	Females	**Adolescents** The figures below comprise a mix of male and female baboons and have not been included in the figures in the second and third columns	**Infants** The figures below comprise a mix of male and female baboons and have not been included in the figures in the second and third columns	Total
2019	7	14	10	14	45
2020	12	19	14	18	63
2021	11	14	8	12	45
2022	12	21	12	20	65

9. What was the percentage increase in the number of males from 2021 to 2022?

A. 1

B. 9

C. 8

D. 100

10. A drastic reduction in the number of females, adolescents and infants was observed during 2021. **Select from the list below, the possible reasons for this decline**.

(i) More than one leopard was observed on the farm
(ii) Territorial behaviour
(iii) The carrying capacity of the field has not yet been reached
(iv) Extreme field fires occurred during the winter months

A. (ii) and (iii)
B. (i), (iii) and (iv)
C. (iii) and (iv)
D. (i) and (iv)

11. Why do patients with kidney failure receive dialysis? To …

A. remove excess fluids and nitrogen waste products from the blood
B. administer medications to treat underlying kidney disease
C. perform a surgical procedure to repair damaged kidney tissue
D. transplant a healthy kidney into the patient

12. **Which one of the following represents a difference between the process of photosynthesis and cellular respiration?**

	Photosynthesis	Cellular respiration
A	Takes place only during the day	Takes place only at night
B	Manufactures glucose	Breaks down glucose
C	Energy is released	Energy is absorbed
D	Enzymes are required	No enzymes are required

13. Which one of the following statements is TRUE about Mitosis?

A. A somatic cell divides to form two different somatic cells
B. It forms cells to repair and replace worn out or damaged tissue
C. Daughter cells are formed that have half the number of chromosomes as the mother cell
D. It produces gametes in humans

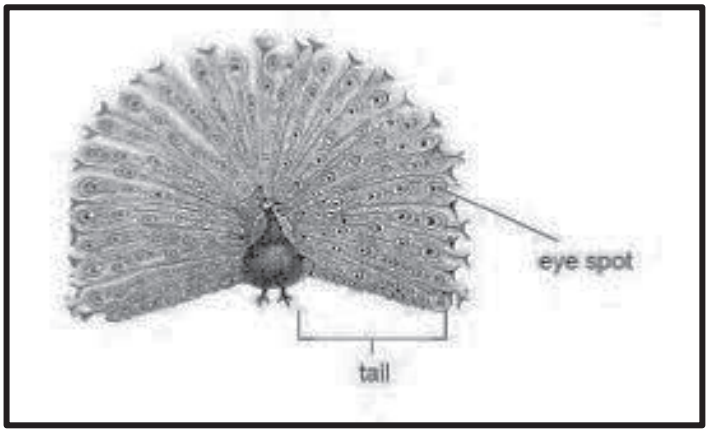
14. The list below provides information about genetic engineering.

(i) Genetic engineering can be used to produce more nutritious food
(ii) Genetically engineered food could cause allergic reactions in humans
(iii) Genetically engineered organisms can lead to a decrease in biodiversity
(iv) Genetic engineering can be used to produce food with a longer shelf-life

Which one of the following combinations are the advantages of genetic engineering?

A. (i) and (iv) only
B. (i), (ii) and (iii) only
C. (ii) and (iii) only
D. (iii) and (iv) only

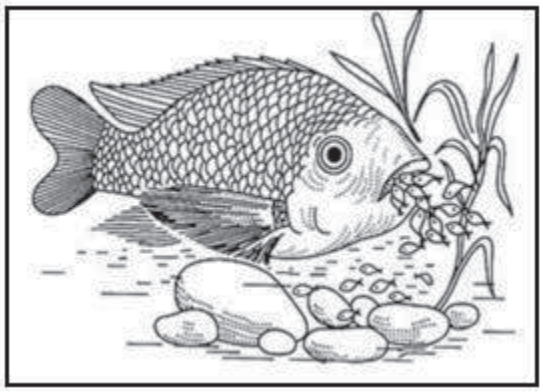
15. A scientist writes a hypothesis that female peahens will choose to mate with a male peacock that has a longer tail and more eyespots over a male with a shorter tail and fewer eyespots.



Identify the dependant variable in this investigation.

A. Number of eyespots
B. Number of mating attempts
C. Tail length
D. Number of female peahens

16. Certain species of fish are mouth brooders. Mouth brooding is a strategy where parents keep the newly hatched fish in their mouths.



Mouth brooding is an example of …

A. fertilisation
B. parental care
C. feeding
D. asexual reproduction

17. As the level of exercise in a person increases, we can expect that the …

A. arteries supplying the skeletal muscles with blood will constrict
B. blood flow to the muscles will decrease
C. arteries supplying the skeletal muscles with blood will dilate
D. body temperature will decrease

18. Which of the following processes takes place during the carbon cycle?

(i) Burning of fossil fuels
(ii) The decay of dead organisms by decomposers
(iii) Respiration by animals
(iv) The conversion of nitrites to nitrates by bacteria

A. (i), (ii) and (iii) only
B. (ii), (iii) and (iv) only
C. (i), (ii), (iii) and (iv)
D. (i) and (iv) only

Questions 19 and 20 refer to an investigation which was conducted by Grade 10 learners to determine the number of endemic species in the forest biome.

19. They repeated the investigation a couple of times to …

A. decrease the reliability of the investigation
B. ensure the validity of the investigation
C. minimise errors
D. increase the reliability of the investigation

20. Some of the following steps were part of the investigation: The Grade 10 learners …

(i) asked permission to do their investigation
(ii) counted endemic animals in the forest biome
(iii) decided on the venue for the investigation
(iv) decided on the tools to record their findings

Which one of the following combinations of steps should be taken before the investigation is conducted?

A. (i), (iii) and (iv) only
B. (ii), (iii) and (iv) only
C. (i), (ii), (iii) and (iv)
D. (i) and (ii) only

21. The correct sequence in which blood flows through the heart from the inferior vena cava is …

A. Left atrium, left ventricle, aorta, rest of the body
B. Right atrium, right ventricle, pulmonary artery, lungs
C. Right atrium, right ventricle, left ventricle, left atrium
D. Right atrium, left atrium, left ventricle, right ventricle

22. How does the structure of arteries, veins, and capillaries contribute to their specific roles in the circulatory system?

A. Arteries have thick walls to withstand high pressure, veins have thinner walls and valves to help blood flow back to the heart, and capillaries are thin-walled to facilitate nutrient and gas exchange.
B. Arteries and veins have identical structures because they both transport blood, capillaries are responsible for pumping blood.
C. Arteries have thin walls to allow for easy diffusion of gases, veins have thick walls to carry oxygenated blood, and capillaries have valves to control blood flow.
D. Veins have the thickest walls because they carry blood away from the heart, arteries are thin walled to regulate pressure.

23. During take-off when flying in an aeroplane, you may experience temporary hearing loss. This is because the …

A. air pressure outside the ear decreases
B. air pressure outside the ear increases
C. ear is blocked by ear wax
D. sound of the engines damages your eardrums

24. An investigation was carried out to determine the effect of caffeine in energy drinks on body temperature. A group of 200 men participated in the investigation.

The following factors were considered during the investigation:

(i) Amount of caffeine
(ii) Average body temperature
(iii) Type of energy drink
(iv) Thermometers to measure body temperature

Which one of the following combinations of factors will affect the validity of the investigation?

A: (i) and (iii) only
B: (i), (iii) and (iv) only
C: (i), (ii), (iii) and (iv)
D: (iii) and (iv) only

25. Which of the TWO gases below are the main causes of global warming?

A. Chlorofluorocarbons and carbon dioxide
B. Carbon dioxide and sulphur dioxide
C. Nitrous oxide and carbon dioxide
D. Carbon dioxide and methane

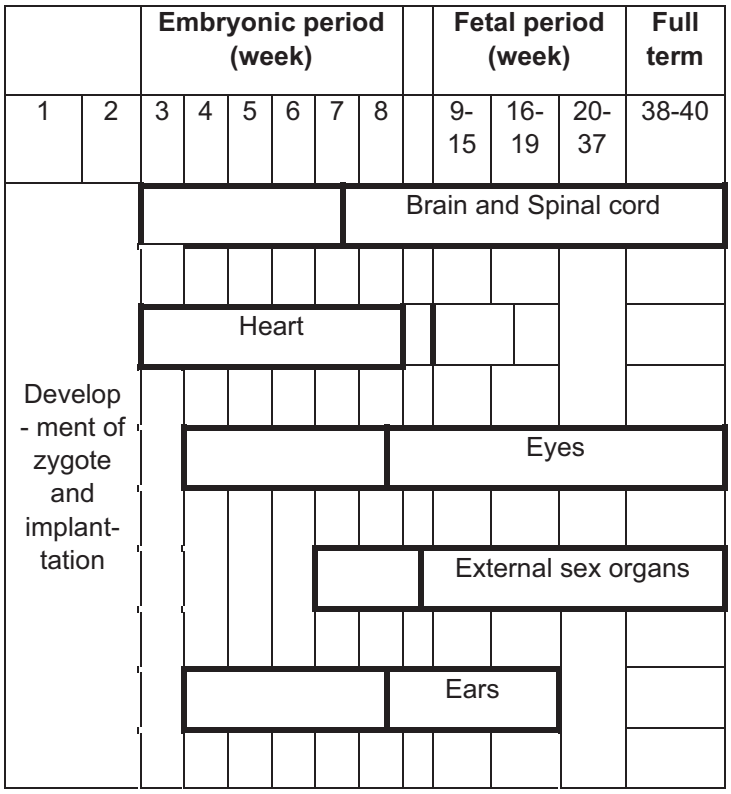
26. What type of pollination is illustrated by the diagram below?

A. Alternation of generations
B. Wind pollination
C. Self-pollination
D. Cross pollination

27. Which row in the table below correctly pairs a flower part with its function?

Flower Part		Function
A	Stamen	Sexual reproduction occurs here
B	Pistil	Produce the pollen required for pollination
C	Petals	Produce glucose during photosynthesis
D	Sepals	Protect the flower in the bud stage

Questions 28 and 29 refer to the following chart which shows the period of the development of some organs in a human fetus during pregnancy.



28. According to the chart, how many weeks does it take for the heart to develop?

A: 6
B: 3
C: 8
D: 5

29. A female drank alcohol during the first 5 weeks of pregnancy. Her child was born with poor co-ordination of movement. The mother was told that the child has Foetal Alcohol Syndrome (FAS) as a result of her drinking alcohol during pregnancy.

Which organ was affected by the use of alcohol during the development of the foetus?

A. Brain and Spinal cord
B. B Eyes
C Ear
D Heart

30. Dicrocoelium dendriticum is a flatworm parasite of grazing vertebrates such as sheep and cattle. **Which combination in the table correctly shows the phyla to which the parasite and host species belong respectively?**

	Dicrocoelium	Cattle/Sheep
A	Annelida	Chordata
B	Platyhelminthes	Arthropoda
C	Annelida	Arthropoda
D	Platyhelminthes	Chordata

31. A municipality is planning the development of a new landfill site for a town. Some of the factors that need to be taken into consideration when developing this landfill site are:

(i) The site should be lined with an impermeable layer.
(ii) The site should be located far from water systems.
(iii) The site should be covered with soil daily.
(iv) All endangered species must be removed and relocated.

Which one of the following combinations is aimed at protecting the environment from pollution?

A. (i), (ii), (iii) and (iv)
B. (i), (ii) and (iii) only
C. (i), (ii) and (iv) only
D. (i) and (ii) only

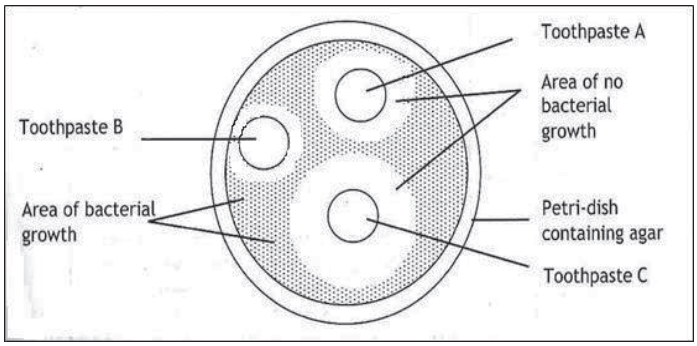
32. What is the role of decomposers in the ecosystem?

A. Decomposers directly capture solar energy for primary producers
B. Decomposers break down dead organic material, recycling nutrients back into the ecosystem and ensuring energy flows through the food web
C. Decomposers produce energy for the entire ecosystem through photosynthesis
D. Decomposers reduce energy availability in the ecosystem by consuming too much organic matter

33. Which one of the following is correct about Thando's weight on the moon? It will be …

A. the same as her weight on earth
B. more than her weight on earth
C. zero
D. less than her weight on earth

Questions 35 and 36 refer to the investigation to test the effectiveness of three different toothpaste brands on preventing the growth of bacteria. The results are shown in the diagram below.



34. The result of this investigation is …

A. toothpaste A kills more bacteria than toothpaste C
B. toothpaste B kills less bacteria than toothpaste A
C. toothpaste B kills more bacteria than toothpaste C
D. toothpaste C kills less bacteria than toothpaste B

35. The independent variable in this investigation is the …

A. bacterial growth
B. toothpaste
C. petri-dish
D. agar

Questions 36 and 37 refer to the data below which shows the effect of bacterial growth on three patients.

A case study observing whether the use of mouthwash killed parasitic oral bacteria focused on three patients presenting with symptoms of gum disease, was conducted by investigating their mouths to identify bacteria *Streptococcus mutans,* a species associated with causing gum disease such as gingivitis. The results were recorded a week after mouthwash.

The results are shown in the table:

Name of Patients	Amount of bacterial growth	
	Gingivitis causing bacteria (millions) before investigation	Gingivitis causing bacteria (millions) after investigation
Patient A	36	16
Patient B	40	17
Patient C	31	9

36. From the investigation, we can conclude that gingivitis …

A. patients using mouth wash have not developed gingivitis
B. patients using mouth wash have developed more gingivitis
C. non-use of mouthwash decreased the growth of gingivitis causing bacteria.
D. the use of mouthwash decreased the growth of gingivitis causing bacteria.

37. From the table above the investigator can deduce that …

A. patient C has the most decrease of bacterial growth after using mouthwash
B. patient A has a high increase of bacterial growth after using the mouthwash
C. patient B has a moderate bacterial growth after using the mouthwash
D. mouthwash has no effect of bacterial growth on all the 3 patients

38. Which one of the following is NOT true about lightning?

A. Lightning can strike the same place multiple times
B. Lightning can strike even if it's not raining in your area
C. Unplugging appliances can protect them from power surges
D. Lying flat on the ground will keep you safe during lightning.

39. Electricity load shedding has been introduced as a measure to prevent National power failures since 2008. **Which one of the following is the main contributing factor to South Africa's electricity load shedding?**

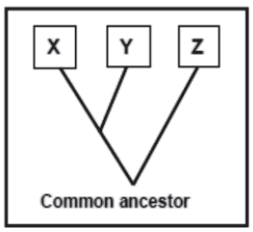
A. The country has transitioned to renewable energy sources
B. Increased electricity exports to neighboring countries.
C. High consumption during major sporting events.
D. Limited electricity supply versus high electricity demand.

40. DNA analysis was done on three related species of fish (X, Y and Z). The number of differences is recorded in the table below. The more differences, the less related the species.

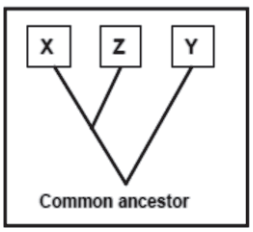
NUMBER OF DIFFERENCES IN DNA		
	Species Y	Species Z
Species X	11	3
Species Y	-	10

Based on this evidence, which phylogenetic tree best represents the evolutionary relationship amongst these three species?

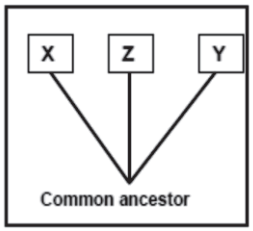
A



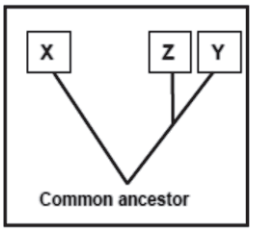
B



C



D



41. The following are characteristics of a group of animals:

(i) Able to interbreed
(ii) Occupy the same habitat
(iii) Produce infertile offspring
(iv) Belong to the same species

Which combination CORRECTLY represents a *population?*

A: (i), (ii), (iii) and (iv)
B: Only (i), (ii) and (iv)
C: Only (i), (ii) and (iii)
D: Only (i) and (iv)

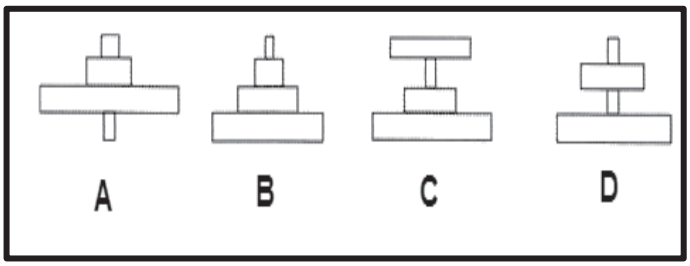
Questions 42 to 43 refer to the food chain and the pyramids below:

Grass→ Cow → Ticks → Tick-bird

42. The Tick-bird in the diagram is a …

A: predator
B: producer
C: primary consumer
D: herbivore

43. The diagrams below show pyramids of numbers. **Which pyramid represents the above food chain in an ecosystem?**



44. The difference in shape between pyramid A and C is in …

A. pyramid A there is less producers than in pyramid C
B. pyramid C there is more primary consumers than in pyramid A
C. pyramid A there is more tertiary consumers than in pyramid C
D. pyramid C there is more secondary consumers than in pyramid A

45. What is an advantage of using hydrogen fuel cells in transportation?

A. Lower upfront costs during operations
B. Longer refueling time during operations
C. Zero greenhouse gas emissions during operations
D. Limited driving range during operations

46. What is the main source of ocean acidification?

A. Increase in ocean temperature
B. Decrease in ocean salinity
C. Increase in atmospheric carbon dioxide
D. Decrease in ocean currents

47. How is indigenous knowledge typically passed down from one generation to the next? Through …

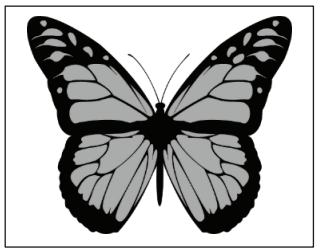
A. written text and documents
B. oral storytelling and traditions
C. formal education and training programs
D. online databases and digital archives

48. Which of the following are examples of connective tissue in the human body?

(i) Bone
(ii) Blood
(iii) Tendons
(iv) Ligaments

A: (i) and (iii)
B: (ii) and (iv)
C: (i) and (iii)
D: (i), (ii), (iii) and (iv)

Questions 49 and 50 refer to the diagram below



49. The phylum in which the organism belongs is…

A. insect
B. arthropoda
C. nematoda
D. chordata

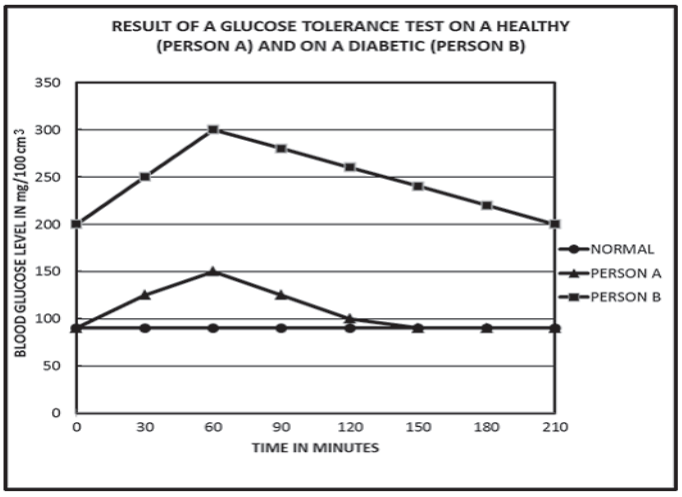
50. The organism in the diagram is…

A. asymmetrical
B. exhibits radial symmetry
C. is bilaterally symmetrical
D. has reverse symmetry

51. What is the primary mechanism by which fynbos ecosystems maintain their unique biodiversity and prevent dominant species from outcompeting others?

A. Regular fires create a mosaic of different vegetation ages, allowing a variety of species to coexist and preventing any one species from dominating the landscape.
B. The poor soils of the fynbos biome limit plant growth, preventing dominant species from outcompeting others and maintaining a balance between different species
C. The Mediterranean climate of the fynbos biome, characterised by cool, wet winters and hot, dry summers, allows a wide range of species to thrive and maintains the diversity of the ecosystem.
D. The unique geology of the fynbos biome creates a variety of different microhabitats that support a wide range of plant and animal species.

Questions 52 to 53 refer to the graph below which shows the results of a glucose tolerance test on a healthy person (Person A) and a diabetic person (Person B). After fasting for ten hours, they each were given a drink of a glucose solution containing 50g glucose. The amount of glucose in their blood was then measured every 30 minutes for the next three hours.



52. How long will it take for the glucose concentration of the healthy person to return to the normal level after the glucose solution was taken?

A. Three hours and thirty minutes
B. One hour
C. Two hours and thirty minutes
D. One hour and thirty minutes

53. The results of this glucose tolerance test are the …

A. healthy person experienced a delayed decline in the blood glucose levels while the diabetic person experienced a rapid decline.
B. healthy person has a normal blood glucose level of 90mg/100cm^3 and the diabetic person 200mg/100cm^3.
C. diabetic person's blood glucose level will take much longer to return to normal than the healthy person.
D. diabetic person has a normal blood glucose level of 200mg/100cm^3 and the healthy person 90mg/100cm^3.

54. What effect will injecting insulin into Person B, have on the results of this test?

A. It decreases the blood glucose concentration quicker back to normal
B. Glucose is immediately excreted in the urine making it concentrated
C. It increases the blood glucose concentration slowly back to normal
D. It inhibits the absorption of glucose by body cells and the liver

Questions 55 and 56 refer to the table and information below about an investigation done to determine the growth of a certain plant species.

A learner investigated the growth of a certain plant species. He planted seeds under the same conditions and the heights of stems were measured 20 days after planting. The results are shown below:

INDIVIDUAL PLANT	HEIGHT AFTER 20 DAYS (mm)
1	90,7
2	94,5
3	87,4
4	82,7
5	92,0
6	91,5

55. The average height (in mm) of the plants is …

A. 91.1
B. 89.8
C. 538.8
D. 14.3

56. Which one of the following is the AIM of this investigation?

A. To determine the growth rate of certain plant species
B. He planted seeds under the same condition
C. The heights of stems were measured 20 days after planting
D. How do certain plant species grow?

57. Many different breeds of sheep have been produced by selective breeding. The diagram and the table below show breeds of sheep and their characteristics.

Breed of sheep	Wool yield	Wool quality	Meat yield	Milk yield
Arapawa	Average	Good	Poor	Average
Awassi	Average	Poor	Very good	Good
Blackbelly	Poor	Poor	Average	Very good
Merino	Very good	Very good	Good	Poor
Tsurcana	Average	Good	Average	Average

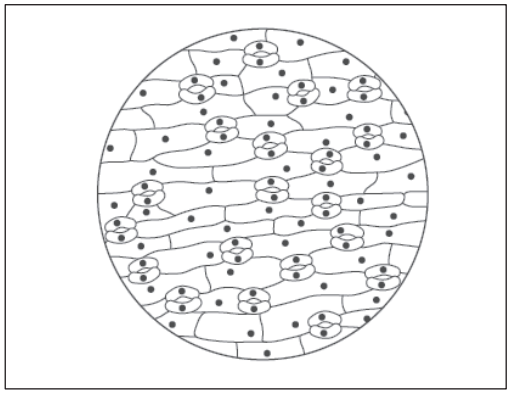
A sheep farmer wants to produce a new breed of sheep with both a very good milk yield and a very good quality of wool. **Which TWO breeds of sheep will be suitable for selective breeding?**

A. Black belly and merino
B. Awassi and merino
C. Awassi and black belly
D. Arapawa and tsurcana

58. Tomatoes are red because …

A. more oxygen is absorbed by ripe tomatoes during respiration
B. many chloroplasts are produced in red tomatoes
C. many pigments are produced in the cell sap of the vacuoles
D. many chromoplasts are produced in red tomatoes

59. How many stomata are found in a lower surface of this micrograph?



A: 8
B: 10
C: 15
D: 20

60. The table below shows the differences between plant and animal cells. Which comparison is CORRECT?

	Plant Cell	**Animal Cell**
A	Have no mitochondria	Have lots of mitochondria
B	Cannot produce glucose	Can produce glucose
C	Have a cell membrane	Have no cell membrane
D	Chloroplasts present	No chloroplasts

61. Which of the following is a correct definition of stem cells?

A. Cells that have a definite nucleus enclosed by a membrane
B. Cells that contain three types of plastids
C. Undifferentiated cells that have the potential to differentiate to form any tissue or organ in the body
D. Cells that divide uncontrollably and continually resulting in the formation of swellings

Questions 62 and 63 refer to the table below:

Gas	Concentration in inhaled air (%)	Concentration in exhaled air (%)
Oxygen	21	16
Carbon dioxide	0,04	4
Nitrogen	78	78
Water vapour	0,96	2

62. The reason for the amount of nitrogen being the same in inhaled and exhaled air is that …

A. nitrogen is absorbed into the bloodstream and the same amount diffuses back to the alveoli to be breathed out.
B. nitrogen gas does not reach the alveoli but remains in the bronchiole until exhalation occurs.
C. nitrogen gas is used in the body but the same amount is produced in the body as a waste product, which is then exhaled
D. nitrogen gas cannot be absorbed by the body in its gaseous form, so the amount inhaled is the same as the amount exhaled.

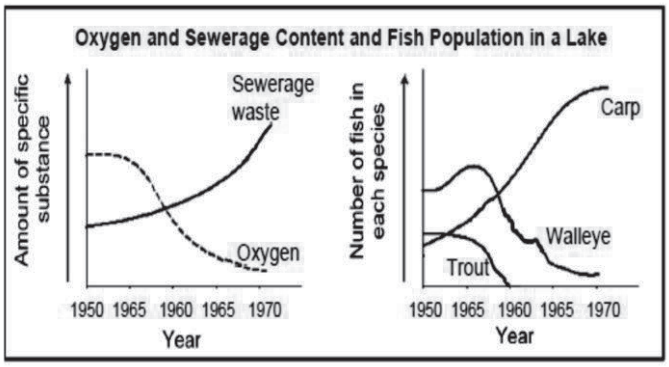
63. Why is the amount of water in the exhaled air more than in the inhaled air?

A. Water from the cells is excreted as water vapour
B. Blood plasma leaks into the alveoli, which is then excreted as water vapour
C. A small amount of water produced during cellular respiration is excreted
D. The respiratory surface must be kept moist at all times and some of this moisture evaporates and is exhaled

64. Cloning is the process …

A. whereby DNA makes an identical copy of itself
B. where an identical copy of an organism is produced
C. where a hybrid organism is produced by combining the genetic material of two different species
D. where genetic manipulation is used to introduce desirable traits into an organism

Study the graph below and answer question 65:



65. Which relationship can be made from the graph?

A. As sewerage waste increases, oxygen content increases
B. As the carp population increases, the walleye population increases
C. As the oxygen content decreases, the carp population decreases
D. As the oxygen content decreases, the trout population decreases

66. Irritable bowel syndrome (IBS) is a medical term used to describe a disease of the digestive system. Symptoms usually occur after certain foods or drinks are consumed. It can cause sudden and severe diarrhoea.

What consequence can this have for a person?

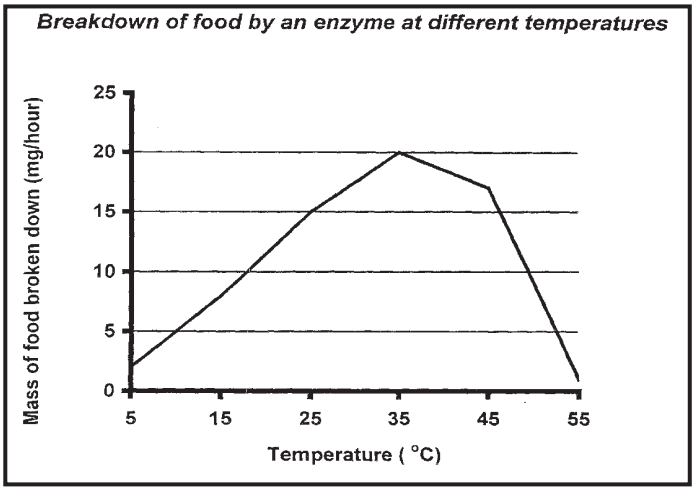
A. Too much water and nutrients will be absorbed in the digestive tract
B. Too little water will be absorbed, but the nutrients will be absorbed
C. Too little nutrients will be absorbed, but water will be absorbed
D. Too little water and nutrients will be absorbed

67. Which of the following is a responsibility of an ophthalmologist, but not an optometrist?

A. Prescribing spectacles or contact lenses
B. Diagnosing eye diseases such as cataracts or glaucoma
C. Performing eye surgery, such as cataract removal
D. Conducting routine eye examinations

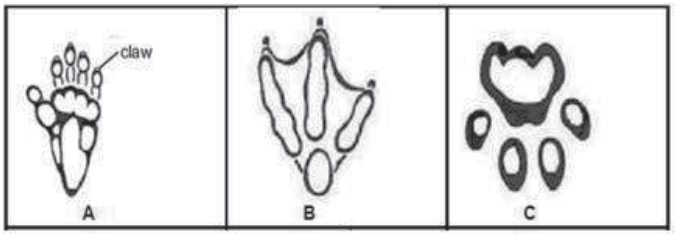
68. The diagram below shows enzyme action.

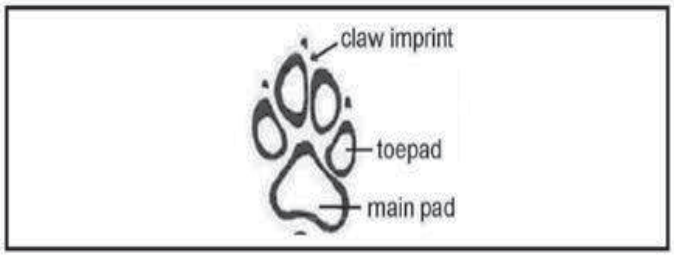
What is the optimum temperature of this enzyme?



A: 35˚C
B: 45°C
C. 55˚C
D. 15˚C

69. Kuhle and Bongile found the animal tracks labelled A, B and C, shown below while walking with their class in a nearby field. Their teacher gave them the dichotomous key below to help them identify the footprints.





1	Track has distinct claw imprints	Go to 2
	Track does not have claw imprints	Go to 5
2	Track has four toepads	Go to 3
	Track has three or five toepads	Go to 4
3	Webbed foot	Crocodile
	Foot not webbed	Cheetah
4	Three toepads	African Penguin
	Five toepads Baboon	Baboon
5	Toepad imprints visible	Go to 6
	Toepad imprints are not visible Four toepad imprints	Elephant
6	Four toepad imprints	Leopard

Use the dichotomous key provided to identify the animal to which footprint A belongs.

A. Baboon
B. African penguin
C. Leopard
D. Cheetah

70. Dogs and some other animals have sweat glands on the pads of their paws only. **These animals lose most of their surplus heat by …**
A. panting
B. sweating
C. urinating
D. radiation

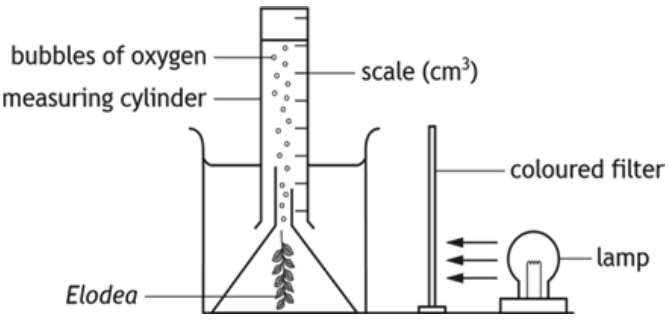
71. Genetically modified organisms (GMO's) are created through …
A. selective breeding, where desirable traits are selectively bred into an organism over several generations.
B. mutagenesis, where an organism's DNA is randomly mutated using chemicals or radiation.
C. gene expression, where the expression of specific genes is altered to produce desirable traits.
D. genetic manipulation, where specific genes from one organism are isolated and inserted into the DNA of another organism.

72. Stars like our sun, generate their energy through the process of …
A. nuclear fission, where heavy elements are split into lighter elements, releasing energy in the process.
B. radioactive decay, where unstable isotopes decay into more stable forms, releasing energy in the process.
C. gravitational contraction, where the star's own gravity causes it to contract and heat up releasing energy in the process
D. nuclear fusion, where hydrogen atoms are fused together to form helium, releasing vast amounts of energy in the process.

73. The advantage of using an electron microscope compared to a light microscope is that an electron microscope …
A. is less expensive to purchase and maintain
B. can only be used to study living cells
C. has a much higher resolution and can image smaller structures
D. is limited to studying only biological samples

74. Which one of the following is NOT a biological importance of water?
A. Breaks down food
B. Provides a medium for chemical reactions to take place
C. Serves as a source of energy
D. Dissolves biochemical compounds

The diagram (Question 75) below shows apparatus used in an investigation to measure the rate of photosynthesis in *Elodea* (pondweed) at different wavelengths of light. Coloured filters were used to change the wavelength of the light. The volume of oxygen collected after 30 minutes was used to measure the rate of photosynthesis



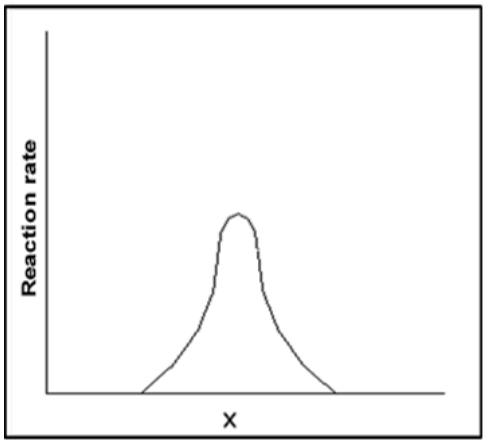
75. Which of the following will increase the reliability of the investigation?

A. The volume of oxygen collected after 30 minutes
B. Repeating the experiment several times and taking the average results
C. The investigation was conducted under a range of different environmental conditions
D. The lamp is placed at the same distance from the plant from the different wavelength

76. What are some of the most important benefits of regular exercise on mental health? It …

A. increases symptoms of anxiety and depression
B. has no significant impact on mental health
C. improves sleep quality and reduces stress levels
D. decreases cognitive functions and memory

77. The graph shows the effect of x on the rate of reaction of an enzyme-catalysed reaction.



X is represented by which combination?

A. Temperature or pH
B. Enzyme concentration or pH
C. pH or substrate concentration
D. Temperature or enzyme concentration

78. How can environmental factors such as temperature and pH affect enzyme activity, and why is this important for maintaining homeostasis?

A. Extreme temperatures and pH levels can change the shape of an enzyme's active site, either increasing or decreasing its ability to catalyse reactions.
B. Temperature and pH have no effect on enzyme function, as enzymes are always active at all conditions.
C. Environmental factors do not affect enzymes in living organisms, since enzymes are designed to work under any condition.
D. Enzymes only function at low pH levels and high temperatures, making these ideal for cellular respiration

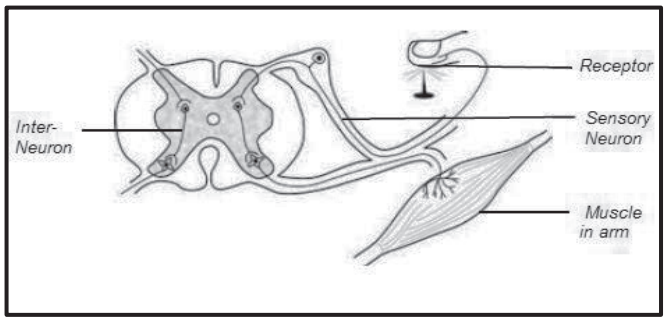
79. How does the body use glycogen as a source of energy, and what happens when glycogen stores are depleted?

A. Glycogen is stored in muscle and liver cells, and when energy is needed, it is broken down into glucose to be used in cellular respiration. When glycogen is depleted, the body begins to break down fats for energy.
B. Glycogen is converted into fatty acids and stored as longterm energy. When glycogen is depleted, the body can only rely on protein for energy.
C. Glycogen is used to synthesise proteins, and when glycogen is depleted, the body can only rely on protein for energy
D. Glycogen is stored in the brain, and when depleted, the brain experiences irreversible damage

80. Why does the liver in animals contain a lot of iron and recommended for consumption by those who suffer anaemia?

A. The iron of broken-down haemoglobin is stored in the liver
B. Erythrocytes are manufactured in the liver and a lot of iron is needed
C. Iron is broken down in the liver to more usable molecules
D. Iron is used in the production of bile

Questions 81and 82 refer to the diagram below of a reflex arc, which is the path of an impulse from a pain receptor in the skin of the finger through the spinal cord to a muscle in the arm. A reflex arc causes a reflex action



81. If the Interneuron in the spinal cord is damaged …

A. no pain will be felt, and the person will be able to pull the finger away
B. pain will be felt, and the person will be able to pull the finger away
C. no pain will be felt, and the person will not be able to pull the finger away
D. pain will be felt, and the person will be able to pull the finger away

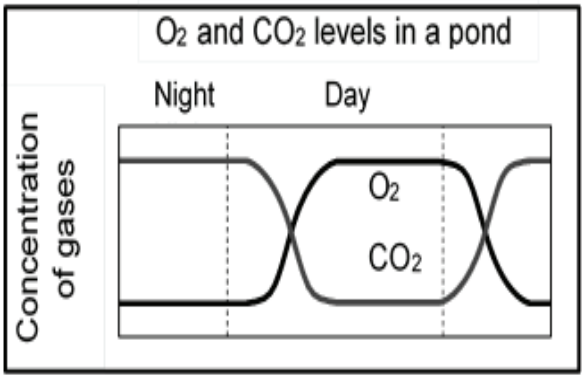
82. A reflex action is a …

A. rapid, involuntary response to a pain stimulus
B. slow, voluntary response to a pain stimulus
C. slow, involuntary response to a pain stimulus
D. rapid, voluntary response to a pain stimulus

83. Carolus Linnaeus classified living organisms: which of the following sequences is correct according to Linnaeus classification system?

A. Kingdom, phyla, class, order, family, genus, species
B. Kingdom, class, phyla, order, genus, family, species
C. Species, genus, family, order, class, phyla, kingdom
D. Species, class, order, family, genus, kingdom, phyla

84. The graph below shows how dissolved O_2 and CO_2 levels changed in a pond over a 24-hour period. **What caused the decrease in O_2 concentration during the night?**

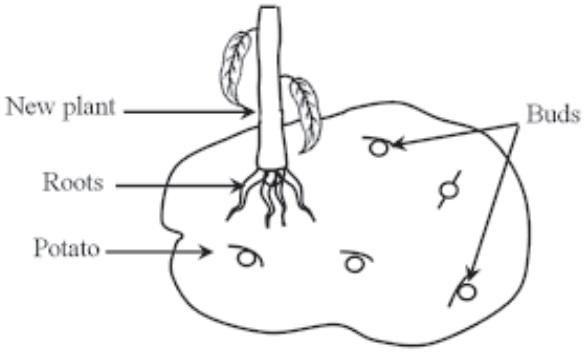


A. Increased evaporation
B. Decreased photosynthesis
C. Increased respiration
D. Decreased temperatures

85. What is the significance of the Calvin Cycle in photosynthesis, and how does it contribute to energy storage in plants?

A. The Calvin Cycle produces glucose from carbon dioxide and water, which is then used as an energy source during cellular respiration
B. The Calvin Cycle produces ATP directly, which is used in the electron transport chain for cellular respiration.
C. The Calvin Cycle is responsible for oxygen production during photosynthesis, contributing to energy storage
D. The Calvin Cycle stores light energy that is later converted into glucose through cellular respiration

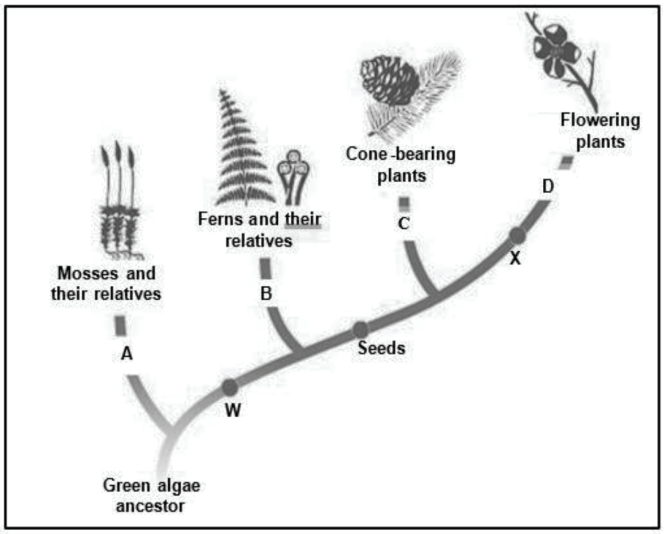
The diagram below (Question 86) represents vegetative reproduction (asexual reproduction).



86. Which of the following serves as a disadvantage of vegetative reproduction?

A. Only one parent is required.
B. Asexual reproduction is quicker because the parent does not need to find a mate
C. All the offspring are identical and if conditions are unfavourable, they won't survive.
D. Asexual reproduction does not rely on pollinators or dispersion agents.

Questions 87-88 are based on the diagram below which is a cladogram of plant evolution



87. Which division of plants is regarded as non-vascular plants in the diagram?

A. A and D
B. A, B and D
C. A only
D. B, C and D

88. Which plant is the common ancestor for plant A, B, C and D?

A. Cone- bearing plants
B. Mosses.
C. Green algae
D. Flowering plants

89. How do phylogenetic trees help scientists understand the evolutionary relationships between species?

A. They predict the future evolution of species by comparing existing traits
B. They display the environmental conditions in which species live
C. They show the chronological order in which species emerged on earth
D. They illustrate the genetic distance and common ancestry between species allowing scientists to track the evolutionary track

90. Below are the common characteristics of plants

(i) they are all unicellular
(ii) they are eukaryotic and cells have a membrane bound nucleus
(iii) cell walls are made of cellulose
(iv) most are autotrophic and have chloroplasts for photosynthesis

Which of the following combinations best classify kingdom plantae?

A. (i) and (iv)
B. (iii) only
C. (ii), (iii) and (iv)
D. (iv) only

91. Which of the following best explains how a scientific method is applied when testing the hypothesis that increased fertiliser use leads to a decrease in soil biodiversity?

A. A series of controlled experiments, where fertiliser concentration is varied, and biodiversity levels are measured.
B. Observing soil biodiversity in different regions with varying natural fertiliser levels.
C. Conducting a single experiment with fertiliser added to the soil and noting whether biodiversity increases.
D. Reviewing published studies on soil biodiversity and fertilisers to draw conclusions

92. A researcher hypothesises that pollution from vehicles increases the incidence of respiratory diseases in urban areas**. Which of the following would be the most effective way to test this hypothesis?**

A. Count the number of vehicles in a city and compare it to the respiratory disease rates.
B. Survey people on their vehicle usage and compare it to their respiratory health.
C. Measure air pollution levels in different areas and analyse the disease rates using statistical methods.
D. Only focus on cities with the highest vehicle counts, ignoring rural areas.

93. In a study that examines the impact of plastic waste on marine life, a researcher measures the growth rate of coral reefs in areas with varying amounts of plastic pollution. **Which one of the following is a limitation in the design of this experiment?**

A. Coral growth rate is a valid measure of the impact on marine life.
B. The study does not account for other factors, such as water temperature or fishing practices, which may affect coral growth.
C. The study only focuses on one species of coral.
D. The sample size of coral reefs is too large.

94. Which one of the following calculations would be most relevant to assess the rate of deforestation in a given area over the past ten years?

A. The area of forest lost each year multiplied by the population growth rate
B. The total area of forest divided by the number of tree species present in the region.
C. The annual deforestation rate percentage calculated by comparing the current forest cover to the original forest cover.
D. The total number of trees cut down each year divided by the total rainfall in the area.

95. A scientist wants to determine if increased carbon emissions from industrial activities are linked to rising global temperatures. **Which method would best allow them to analyse the relationship statistically?**

A. Use regression analysis to correlate temperature changes with carbon emission levels over time.
B. Compare the carbon emissions of two regions with similar climates but different temperatures.
C. Conduct a random survey of people's awareness of carbon emissions and temperature changes.
D. Examine the temperature and carbon emission data for one city over the past five years.

96. What is a potential effect of human overfishing on marine ecosystems, and how can this be modelled using the scientific method?

A. The increase in fish population size, which can be studied by tracking individual fish growth.
B. The decrease in biodiversity and fish population sizes, which can be modelled by conducting a time-series analysis of fish stocks.
C. The increase in aquatic plant species due to decreased fish consumption, which can be modelled by comparing areas with high fishing activity to untouched areas
D. The reduction in the global human population, which can be modelled by calculating the rate of fish consumption per person.

97. To understand the long-term effects of agricultural runoff on freshwater ecosystems, a researcher collects data on nitrate concentrations in a river over a five-year period. **What type of data analysis would best reveal the cumulative effects?**

A. A descriptive analysis of the nitrate concentration for each year independently.
B. A regression analysis of the relationship between nitrate concentration and aquatic biodiversity.
C. A time-series analysis to identify trends and correlations between runoff levels and ecosystem changes.
D. A comparison of nitrate levels with the number of fishing licenses sold in the area.

98. Which of the following is a potential indirect consequence of large-scale deforestation on local weather patterns?

A. A decrease in biodiversity within the forest ecosystem.
B. An increase in the frequency of extreme weather events, such as floods and droughts.
C. A reduction in the temperature of the surrounding area due to increased soil moisture.
D. A decrease in the population of migratory species that use the forest for breeding.

99. A study finds a positive correlation between the rise in global temperature and the increase in human-made carbon dioxide emissions. However, some researchers question the accuracy of the study's methods. **What is the next logical step in the scientific method?**

A. Publish the study immediately to raise awareness about the results.
B. Conduct further experiments with more controls and peer reviews to verify the findings.
C. Discard the data and start the study over from scratch.
D. Accept the results as conclusive and stop further research on the topic.

100. Which of the following calculations would be useful in determining the carbon footprint of a large manufacturing facility?

A. The total energy consumed by the facility divided by the number of products produced.
B. The total amount of CO_2 emitted by the facility per unit of production over a specific time period.
C. The amount of waste generated by the facility compared to the number of workers employed.
D. The average temperature increases in the facility's surrounding environment during production hours.

~END~

NOTES: