

SOUTH AFRICAN AGENCY FOR SCIENCE AND TECHNOLOGY ADVANCEMENT 59th LIFE SCIENCES OLYMPIAD

GRADES 10 -12

2024

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.

<u>Three hours</u> are allowed to answer the questions

1. In which one of the following is the receptor correctly matched with the sensation?

- A Photoreceptor vision
- B Thermoreceptors taste
- C Chemoreceptor hearing and balance
- D Mechanoreceptor temperature
- 2. It is more difficult to obtain oxygen at higher altitudes than lower altitudes, because ...
- A there is less haemoglobin in the blood at higher altitudes
- B there is less oxygen in the atmosphere at higher altitudes
- C the atmospheric pressure is more at higher altitudes
- D haemoglobin has a higher affinity for oxygen at higher altitudes
- 3. The primary source of energy for humans under normal circumstances is ...
- A proteins
- B lipids
- C carbohydrates
- D vitamins
- 4. The vitamin that prevents scurvy is found in ...
- A butter, olive oil and milk
- B milk, fish liver oil and cheese
- C oranges, lemons and tomatoes
- D meat, liver and whole grain bread
- 5. A division of one cell by mitosis will produce ...
- A two nuclei, each of which has a chromosome number half that of the parent nucleus
- B four nuclei, each of which has a chromosome number half that of the parent nucleus
- C two nuclei, each of which has the same chromosome number as that of the parent nucleus
- D four nuclei, each of which has the same chromosome number as that of the parent nucleus
- 6. The correct sequence of matter from the simplest to the most complicated is ...
- A atom, organelle, cell, tissue, molecule
- B organelle, atom, molecule, tissue, cell
- C atom, molecule, organelle, cell, tissue
- D cell, molecule, atom, tissue, organelle
- 7. The following are functions of parts of plants:
- (i) Anchors the plant firmly in the soil
- (ii) Produces glucose for the aerial parts of the plant
- (iii) Conducts water and salts to the stem
- (iv) Absorbs water and mineral salts from the soil

Which one of the following combinations shows the functions of roots?

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

QUESTIONS 8 AND 9 REFER TO THE DIAGRAM OF THE SKELETON OF A GREYHOUND.



- 8. The bone indicated by part B is the ...
- A tibia
- B radius
- C femur
- D humerus
- 9. What special feature does the joint at A, between the atlas [first vertebra] and the skull have with regards to movement?
- A The joint allows limited universal movements sideways, forwards and backwards
- B The skull and vertebra can rotate against each other in one plane
- C The joint allows forward and backward movements only
- D The atlas and the skull are interlocked and movement occurs in the neck

10. Which of the following, in their correct proportions, will constitute a balanced diet?

- A Mineral salts, vitamins, carbohydrates, protein, water and fibre
- B Mineral salts, vitamins, lipids and fibre
- C Vitamins, carbohydrates, lipids, proteins, water and fibre
- D Mineral salts, vitamins, carbohydrates, lipids, proteins, water and fibre

QUESTIONS 11 AND 12 ARE BASED ON THE DIAGRAM BELOW, WHICH SHOWS PART OF THE HUMAN DIGESTIVE SYSTEM.



- 11. Which of the numbered parts secrete substances that assist in increasing the pH of the acidic chyme to alkaline as it comes out of the stomach?
- A 1 and 2 only
- B 2, 4 and 6 only
- C 2, 4 and 5 only
- D 4, 5 and 6 only
- 12. The sequence of parts of the small intestine following the part numbered 3 are the ...
- A duodenum, jejunum, ileum
- B ileum, jejunum, duodenum
- C jejunum, ileum, duodenum
- D duodenum, ileum, jejunum

13. Which one of the following is a correct difference between natural and artificial immunity?

	Natural	Artificial
Α	Uses a vaccine	Uses synthetic antibodies
В	Response to an infection	Response to a vaccination
С	No memory cells formed	Memory cells formed
D	Only active immunity	Only passive immunity

- 14. The factors below may help prevent some diseases.
- (i) Avoiding mosquito bites
- (ii) Disinfecting and chlorinating water
- (iii) Use of antiviral drugs
- (iv) Vaccination

Which option identifies the correct preventative factors of the listed diseases?

	Cholera	Malaria	Tuberculosis
Α	(ii)	(i)	(iv)
В	(i) and (ii)	(ii)	(iii)
С	(iv)	(ii)	(iii)
D	(iii)	(i) and (ii)	(iii) and (iv)

15. HIV is the virus that causes AIDS, which can be spread

- A during sexual intercourse
- B through saliva, or sweat
- C in the air
- D through food and water
- 16. The exoskeleton in all insects and spiders ...
- A allows unlimited growth
- B forms a rigid case with no movement between different parts of the body
- C greatly reduces the loss of water
- D serves as attachment for the endoskeleton

17. The volume of urine excreted increases when alcohol is consumed because alcohol ...

- A causes the kidney to function faster
- B causes the hypothalamus to secrete less ADH
- C causes the hypothalamus to secrete more ADH
- D makes you thirsty and then you drink more fluids

QUESTIONS 18, 19 AND 20 REFER TO THE INVESTIGATION BELOW.

Nandi and Geraldine planned an investigation to determine the habitat preference of woodlice in a petri dish. They placed 10 woodlice in a petri dish. Half of the petri dish was covered in black paper and the other half left in the light. The number of woodlice in each side was counted every two minutes.

The results are shown in the table below:

Time in minutes	Number of woodlice	
	Dark side	Light side
2	6	4
4	7	3
6	7	3
8	8	2
10	10	0

18. Which of the following represents a hypothesis that is supported by the results?

- A There will be fewer woodlice in the dark side than in the light side
- B There will be more woodlice in the dark side than in the light side
- C There will be no habitat preference for the wood lice
- D There will be an equal number of woodlice in both the dark side and the light side

19. The dependent variable in this investigation is the ...

- A light and dark side
- B time in minutes
- C number of woodlice in the dark and light side
- D dark side

20. The independent variable in this investigation is the ...

- A light and dark side
- B time in minutes
- C number of woodlice in the dark and light side
- D type of woodlice

21. Which one of the following statements about cellular respiration is correct?

- A Cellular respiration in a green plant involves only the intake of carbon dioxide and the release of oxygen.
- B Cellular respiration involves only the intake of oxygen and the release of carbon dioxide.
- C Organisms cannot respire in the absence of oxygen
- D Cellular respiration makes energy available to all living cells.

22. Which three of the following parts of the heart contain oxygenated blood?

- (i) Right atrium
- (ii) Left atrium
- (iii) Right ventricle
- (iv) Left ventricle
- (v) Aorta
- (vi) Pulmonary artery
- A (i), (iii) and (vi)
- B (ii), (iv) and (v)
- C (i), (ii) and (v)
- D (iii), (iv) and (vi)

23. The diagram below represents a flower.



The names of the parts labelled A to E on the diagram above respectively are ...

- A sepal, stigma, style, ovary, ovule
- B petal, stigma, anther, ovule, ovary
- C sepal, anther, stigma, ovary, ovule
- D petal, anther, stigma, ovule, ovary

QUESTIONS 24 AND 25 REFER TO THE GRAPH BELOW.



The graph shows the results of an investigation done to determine the effect of light intensity on the size of the pupil of the eye.

24. Which one of the following is the aim of this investigation?

- A To determine the effect of light intensity on the size of the pupil of the eye
- B What effect does light intensity have on the size of the pupil of the eye?
- C Light intensity increases the size of the pupil of the eye
- D Light intensity decreases the size of the pupil of the eye
- 25. Which one of the following statements is a conclusion that can be made from the results?
- A As the distance from the light source increases, the size of the pupil increases
- B As the distance from the light source decreases, the size of the pupil increases
- C The distance from the light source has no effect on the size of the pupil
- D As the distance from the light source increases the size of the pupil decreases

26. In a healthy male, which one of the following is an average blood pressure in mmHg?

- A Systolic pressure 80, diastolic pressure 120
- B Systolic pressure 120, diastolic pressure 80
- C Systolic pressure 180, diastolic pressure 100
- D Systolic pressure 180, diastolic pressure 90

27. The arrangement, number and kind of teeth in the jaws of a normal adult human female are ...

- A 1 incisor, 2 canines, 2 premolars and 3 molars
- B 2 incisors, 1 canine, 2 premolars and 3 molars
- C 1 incisor, 2 canines, 3 premolars and 2 molars
- D 2 incisors, 1 canine, 3 premolars and 2 molars
- 28. Each of the following statements regarding arteries is true, except that ...
- A they have thick muscular walls.
- B only those near the heart contain valves called heart valves.
- C they carry blood under high pressure.
- D they have a larger lumen (opening) than similar-sized veins.
- 29. A good garden soil ...
- A drains rapidly and has a high water-retaining ability
- B consists mainly of sand which is well-aerated.
- C has a high water-retaining ability and drains slowly.
- D has a low water-retaining ability and drains rapidly.
- 30. The diagram below illustrates a hawkmoth pollinating an orchid flower. This feeding relationship indicates that ...



- A both the hawkmoth and the orchid benefit.
- B the hawkmoth benefits and the orchid is harmed.
- C the orchid benefits and the hawkmoth is harmed.
- D both the hawkmoth and the orchid are harmed.

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31. Fertilisation is the process whereby ...

- A pollen is transferred from the anther of a flower to the stigma of the same flower.
- B the sperm cell breaks down the membrane of the egg cell to penetrate it.
- C the nucleus of a sperm cell fuses with the nucleus of an egg cell to form a diploid zygote.
- D the male cell fuses with the female cell to form a new plant or animal.
- 32. During wine making ...
- A bacteria on the skin of the fruit cause alcoholic fermentation
- B the microorganism that releases alcohol undergoes aerobic respiration
- C sugar in the fruit changes into alcohol and carbon dioxide
- D a single-celled fungus releases alcohol and carbon dioxide
- 33. Iodine deficiency causes ...
- A anaemia
- B scurvy
- C goitre
- D night blindness
- 34. Which of the following are risk factors that could cause a heart disease?
- (i). Low blood pressure
- (ii). A diet high in saturated animal fat
- (iii). A diet high in fresh fruit and vegetables
- (iv). Lack of exercise
- (v). Smoking cigarettes
- (vi). Stressful lifestyle
- A (i), (ii), (iii) and (iv)
- B (ii), (iii), (iv) and (v)
- C (i), (ii), (iii), (v) and (vi)
- D (i), (ii), (iv), (v) and (vi)
- 35. Which of the following activities will produce the lowest carbon footprint?
- A Travelling 50km by train
- B Travelling 20km by bus
- C Travelling 10km by car
- D Travelling 25km by bicycle
- 36. Most waves on the ocean are generated by ...
- A the rotation of the earth.
- B earthquakes.
- C volcanic eruptions underwater.
- D wind.

37. A young woman stepped on a dirty, rusty nail. The following diagrams show bacteria isolated from the wound and a range of antibodies that were already in her body. The antibodies have a specific shape that binds with the antigen found on the surface of the bacteria.



The bacterium most likely to cause a severe infection is ...

- A **M**
- в **N**
- с о
- D **P**

38. The fossilised remains of extinct organisms ...

- A provide a complete record of evolutionary history
- B provide evidence that life has evolved over time
- C demonstrates that organisms do not change over time
- D demonstrates that nature never 'takes leaps' in evolution
- 39. The list below is about fossils.
- (i) Fossilisation occurs only when all oxygen is excluded from the organism
- (ii) Fossilisation requires the normal rate of sedimentation to slow down
- (iii) Most existing fossils are still buried in rock layers below ground level
- (iv) Soft bodied organisms do not leave fossils behind

Which combination explains why there are gaps in the fossil records?

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

- 40. During the Precambrian era, stromatolites flourished in the shallow warm oceans across the Earth. Stromatolites are often referred to as the world's oxygen pumps because they ...
- A protected the Earth's atmosphere from toxic high levels of oxygen
- B produced oxygen for the evolution of aerobic multicellular organisms
- C absorbed excess oxygen from the oceans
- D maintained the oxygen levels that existed when the Earth was formed about 4.5 billion years ago.
- 41. When an infection was treated with a new drug, the inflammation decreased. In a few patients the inflammation returned after one week. The probable reason for this is that ...
- A the patients developed an allergic reaction to the drug
- B the decrease in inflammation allowed the pathogens to become resistant to the drug
- C the white blood cells were not functioning properly and therefore the inflammation returned
- D a few pathogens resistant to the drug were present at the start of the infection

QUESTIONS 42, 43 AND 44 REFER TO THE FOOD WEB BELOW.



- 42. Name the producer in the food web.
- A Grass
- B Springbok
- C Zebra
- D Lion

43. What may happen if the hyena was removed from this ecosystem?

- A Decrease in the springbok population
- B More food for the lion population
- C More food for the zebra population
- D Decrease in the lion population

44. What do the arrows in the food web indicate?

- A The way in which energy is produced from one trophic level to the next
- B Energy remains constant from one trophic level to another
- C Energy is re-circulated through the ecosystem
- D The direction in which energy flows from one trophic level to the next
- 45. The diagram below shows what happens to energy contained in grass eaten by a young horse.



What percentage of the energy taken in by eating grass, becomes part of the body of the young horse?

- A 2%
- B 20%
- C 38%
- D 62%
- 46. Human urine is produced in the kidneys and temporary stored in the urinary bladder. Which one of the following forms the highest constituent of a normal urine?
- A Urea
- B Sodium ion
- C Water
- D Creatinine

47. Poaching refers to ...

- A the relocation of organisms to a new habitat when the old habitat is destroyed by fire
- B the intentional introduction of alien/exotic plants
- C the use of chemicals to kill pests
- D the illegal killing or removal of organisms from their habitat
- 48. Rhinoceros poaching in South Africa has intensified recently because ...
- A Asian populations of rhino species are too dangerous to hunt and kill
- B the black-market price for illegal rhino horn has dropped
- C the demand for rhino horn is increasing in Asian countries
- D there are too many rhinos in local game reserves

QUESTIONS 49, 50 AND 51 ARE BASED ON THE DATA PROVIDED IN THE TABLE BELOW:

	Domestic use of water according to availability of water for a family of four		
	Seven families with different lifestyles	Water used per person per day in litres	Water used per household per day in litres
1.	Minimum required for health (drinking, cooking, body hygiene). Nearest source 15km. No transport	3	12
2.	Water used for drinking, cooking, body hygiene). Nearest source is 1km. No transport	5	20
3.	Water tank near the home or in the village	10	40
4.	House with one tap and a shower	50	200
5,	Bath, shower and three taps. No garden	174	696
6.	Bath, shower and several taps, washing machine and dishwasher. No garden	300	1200
7.	Bath, shower and several taps, washing machine and dishwasher. Garden with swimming pool	1500	6000

49. Family number 6 ...

- A uses more water per person than family number 7
- B uses as much water for gardening as they use inside the home
- C uses 300 litres per person per day
- D uses the same amount of water as families 1, 2, 3 and 4 combined

50. From the data in this table, we can conclude that \dots

- A the more easily accessible the water, the more will be used
- B all rural households use less than 200 litres of water per day
- C all city dwellers waste a great deal of water
- D none of these 7 families waste water

51. To encourage saving water ...

- A municipalities should raise the cost of water for all these families
- B the price of water should increase in increments according to the volume of water used per household
- C all households should get rid of gardens and buy their vegetables at supermarkets
- D all households should take their laundry to laundromats instead of having washing machines
- 52. The diagram below shows three different fish species labelled P, Q and R.



Use the dichotomous key provided to identify fish R.

Dichotomous key:

1a	If fish has spots	go to 2
1b	If fish does not have spots	go to 3
2a	If fish has chin "whiskers"	Spotted goat fish
2b	If fish does not have "chin whiskers"	Bund- tail puffer

- A Trumpet fish
- B Spotted eagle ray
- C Spotted goat fish
- D Band-tail puffer

53. Study the following health issues:

- (i) Sunburn
- (ii) Premature aging
- (iii) Skin cancer
- (iv) Cataracts
- (v) Convulsions

Which combination of health issues is a result of prolonged ultra-violet (UV) light exposure?

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

- 54. Which statement about the human pulse rate is correct?
- A Young children commonly have a higher pulse rate than the elderly.
- B Taking part in exercise will lower the pulse rate.
- C Young children commonly have a lower pulse rate than the elderly.
- D Taking part in exercise has no influence on the pulse rate.
- 55. The diagram below shows three people looking in different directions.



Which one identifies the correct side of each of the letters P, Q, R and S?

	Р	Q	R	S
А	posterior	anterior	dorsal	anterior
В	dorsal	ventral	ventral	dorsal
С	ventral	dorsal	dorsal	ventral
D	anterior	ventral	posterior	dorsal

- 56. If the magnifying power of the ocular (eyepiece) in a microscope is 10 X, and that of the objective 40 X, the total magnification of a specimen will be ...
- A 10 X
- B 40 X
- C 50 X
- D 400 X

57. Scientists have been able to identify and describe about 1.2 million species of organisms. New species are still being discovered.

What made it possible for scientists to discover and describe many more species in the past 50 years than before?

- A Modern scientists are far more intelligent than earlier scientists
- B The rate of evolution has escalated during the last century
- C New technology allows access to remote areas, e.g. deep ocean floors
- D Space technology helps with the identification of organisms on other planets
- 58. An indigenous species is an organism that ...
- A is native to a country where it occurs naturally
- B occurs in South Africa but was imported from Australia
- C was bred by farmers such as sheep, goats, cattle and horses
- D is in danger of extinction
- 59. The variety of living organisms on Earth is referred to as ...
- A ecosystems
- B biodiversity
- C speciation
- D biogeography
- 60. The king protea or sugarbush, *Protea cynaroides*, is endemic to the Cape Floral Region. This indicates that this protea:
- (i) Is found naturally in the fynbos biome of the Western Cape
- (ii) Is unique because it does not grow naturally in any other province
- (iii) Is found in fynbos biomes across the world
- (iv) Is limited to only one region or very few regions in one ecosystem

Which one of the following options applies to the above statement?

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

QUESTIONS 61, 62 AND 63 REFER TO THE INVESTIGATION BELOW.

An investigation was conducted to determine the effect of alcohol on the reaction time in humans.

The procedure was as follows:

- Fifty adult volunteers were used
- Their reaction times were measured at the beginning of the investigation
- They were each given alcohol to drink
- Their reaction times were measured again after 30 minutes

The following factors were considered during the investigation:

- (i) Age of the volunteers
- (ii) Number of volunteers
- (iii) Intake of the same type and equal amount of alcohol
- (iv) Same instrument used to measure the reaction time
- (v) Investigation repeated many times to calculate an average
- 61. Which one of the following combinations of factors will ensure the validity of the investigation?
- A (ii) and (v) only
- B (i),(iii) and (iv) only
- C (i),(ii), (iii),(iv) and (v)
- D (ii), (iii) and (iv) only
- 62. Which one of the following combinations of factors will ensure the reliability of the investigation?
- A (ii) and (v) only
- B (i), (iii) and (iv) only
- C (i), (ii), (iii), (iv) and (v)
- D (ii), (iii) and (iv) only
- 63. Why was the reaction time measured at the beginning of the investigation before alcohol was taken in by the volunteers?
- A To ensure that all the volunteers were sober
- B To ensure that their reaction times were all the same
- C To ensure that their reaction times were all different
- D To investigate whether it's the alcohol which influenced the reaction time

- 64. Genetically engineered crops (GMO's) ...
- A grow faster than natural varieties but produce smaller seeds and kernels
- B are engineered to make seeds cheaper so that poorer farmers can afford to buy them
- C can be modified to become more resistant to droughts and pests
- D always contain genes that were transferred between individuals of the same species
- 65. An astronomer wishes to measure the distance between two galaxies. Which of the units of measure listed below should she use?
- A Kilometres
- B Light hours
- C Light years
- D Million years
- 66. Rising temperatures on Earth, as a result of the enhanced greenhouse effect, have led to the melting of ice in glaciers.

The graph below shows the results of an investigation that measured changes in the size of an area covered with ice in the Arctic region between 1978 and 2006.



The difference between the size of the area covered with ice in 1978 and the size of the area covered with ice in 1998 is ...

- A 1.3 million km²
- B 7.2 million km²
- C 0.7 million km²
- D 5.9 million km²

- 67. A group of stars in the southern hemisphere that we can use to find the direction SOUTH, is the ...
- A Orion Belt
- B Southern Cross
- C constellation
- D kite
- 68. Each of the following reasons why scientists choose to place telescopes in the Karoo in South Africa is true, except ...
- A it has clear skies
- B the air is very windy
- C there is little light pollution
- D it has low humidity
- 69. The graph below shows the percentages of populations affected by food insecurity in some developing regions in the world.



Which one of the regions below does NOT show improvement in its food security [access to enough nutritious food for all people at all times] for the period shown?

- A Latin America
- B Sub-Saharan Africa
- C East and North Africa
- D South Asia

70. A fuel cell is an electrochemical cell which converts ...

- A chemical energy into electrical energy
- B solar energy into potential energy
- C chemical energy into mechanical energy
- D electrical energy into chemical energy

- 71. Why is uranium used as nuclear fuel in nuclear power plants?
- A The atomic forces between the atoms are relatively strong
- B Uranium is a radioactive isotope that doesn't decay
- C Uranium occurs naturally in the earth's crust
- D Under certain conditions it can readily split to yield a lot of energy
- 72. How does the process of electrolysis produce hydrogen in hydrogen fuel cell technology?
- A By running electricity to combine hydrogen and water
- B By separating water into hydrogen and oxygen and generating electricity
- C By passing electricity into water to separate it into hydrogen and oxygen
- D By passing electricity into water to evaporate it into hydrogen
- 73. The most effective way of escaping a rip current [a strong flow of water from the beach] is ...
- A to catch a wave and let it carry you back to shore
- B swim parallel to the shoreline
- C swim against the current with all your strength
- D allow the current to carry you out to sea

74. The following refer to tsunamis:

- (i) Can reach a height of up to 30m
- (ii) A series of long, high waves in the ocean
- (iii) A result of water displaced in the ocean floor
- (iv) Main impact is coastal flooding

Which combination will define a tsunami?

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

75. The map below shows different sites where evidence of South Africa's rich fossil history may be seen.



Which letter represents the National Heritage Site and set of caves where the fossil remains of humans were found?

- A **D**
- в С
- С В
- D **A**
- 76. One reason why some people are against genetic engineering is that ...
- A crop yields are improved
- B the taste and quality of food is improved
- C the potential impact on human health is unknown
- D the use of herbicides is reduced

QUESTIONS 77 AND 78 REFER TO THE PHYLOGENETIC TREE OF SOME PRIMATES.



- 77. Which of the following primates are more closely related to humans in this phylogenetic tree?
- A Lemurs and Lorises
- B Tarsiers
- C Gorillas
- D Chimpanzees
- 78. According to the phylogenetic tree, the most recent common ancestor of ...
- A humans and chimpanzees became extinct 2 million years ago
- B humans and gorillas became extinct 15 million years ago
- C humans and chimpanzees became extinct 6 million years ago
- D gorillas and chimpanzees became extinct 2 million years ago
- 79. Which of the following statements is incorrect with regard to recombinant DNA technology? It ...
- A allows certain hormones to be produced in large quantities
- B can produce tomatoes which have a longer shelf-life
- C enables various vegetables to be less resistant to drought and insects
- D can produce rice with lots of iron and vitamins in it
- 80. In genetic engineering, DNA may be changed by all the ways below, except ...
- A adding a foreign gene from another species
- B altering the degree to which a gene is turned on or off
- C deleting or deactivating a gene to prevent it from expressing
- D when the DNA molecule makes an identical copy of itself during replication

81. Natural selection is the process by which ...

- A the age of selected fossils is calculated
- B organisms with traits well suited to their environment survive and reproduce more successfully
- C any individual that cannot escape from its predators will die without reproducing
- D most species are not structurally suited to their environment

QUESTIONS 82 AND 83 ARE BASED ON A TYPICAL SNELLEN CHART AND THE EXTRACT BELOW.

(A Snellen chart is used to estimate visual acuity, which is the ability to see objects clearly). The extract below the Snellen chart explains how it is used.

SNELLEN CHART



EXTRACT

A Snellen chart helps to determine if a person meets the legal visual acuity (the ability to see clearly) requirement for a valid driver's licence (20/40). A person, standing 6 metres away from the chart, must cover one eye and he/she reads the letters of each row out loud. Starting from the top, the smallest row that can be accurately read, indicates the visual acuity in that specific eye.

The ratio of 20/20 is the smallest line that a person with normal acuity can read at a distance of 6 metres. When a person undergoes the visual acuity test to obtain a driver's licence, special equipment is used to present the letters in different patterns, arrangements and sizes.

[Adapted from www.allaboutvision.com]

- 82. A person can only read accurately to the end of line 5 on the Snellen chart. What is his/her visual acuity ratio?
- A 20/20
- B 20/40
- C 20/50
- D 20/30
- 83. Why is special equipment used to present different patterns, arrangements and sizes of letters when testing eyesight for a driver's licence?
- A To improve a learner driver's driving ability and thus prevent accidents
- B So that learner drivers cannot memorise the patterns and cheat on the test
- C To create a perception of depth and ensure the learner driver's ability to judge distance
- D To ensure that the learner driver see images with both eyes

QUESTIONS 84, 85 AND 86 ARE BASED ON THE EXTRACT OF THE AFRICAN POTATO.

The African potato (*Hypoxis hemerocaluidea*) is widely used for traditional medicine in South Africa and regarded as a natural resource. It is commercially used for human ailments such as testicular tumours, enlargement of the prostate gland, urinary infections and stomach aches. It is also used as a laxative.

Research has shown that 73 tons or 428 000 bulbs are widely harvested by sangomas and collectors in KwaZulu-Natal every year. Claims that the extract of African potato can be used to treat diseases like HIV/Aids and cancer has put this traditional medicine under the spotlight.

[Source: www.kznwildlife.com]

84. Which medical condition cannot be treated with *Hypoxis hemerocaluidea*?

- A Stomach aches
- B Constipation
- C Urinary tract infections
- D All different body tumours

- 85. Identify the incorrect strategy to prevent exploitation of plants like the African potato.
- A Establish less nurseries and nature reserves
- B Legislation to control harvesting
- C Education and campaigns
- D Penalties for breaking legislation
- 86. What is the consequence of over exploiting plants like the African potato?
- A Food chains/webs in an environment can be destroyed
- B Create habitats for many organisms in the environment
- C Increase in biodiversity in the environment
- D Decrease the run-off of water in the environment
- 87. Cloning is the process when identical organisms are produced from only one parent. What is an advantage of cloning?
- A Reducing the gene pool by reducing variation and genetic diversity
- B May lead to killing of clones to obtain spare body parts
- C Produce offspring for organisms that are infertile and cannot have their own offspring
- D It is an expensive process and not all people can afford it
- 88. Stem cells are undifferentiated cells that can develop into any body cell. Which one of the following is a source of human stem cells?
- A Embryo, bone marrow and brain only
- B Brain, skin, liver and blood vessels only
- C Skin, liver and blood vessels only
- D Bone marrow, brain, embryo, blood vessels, skin and liver only

89. What is an argument against the use of stem cells?

- A Provide replacement for organs damaged by age and disease to improve the quality of life
- B Interfere with religion and culture because it is regarded as playing the role of God
- C Stem cells are used in research to see if they can cure different diseases
- D Stem cells can be stored when needed in future
- 90. Which of the following occurs in the human skin on a very cold day?
- A Hairs raised to an almost vertical position on the skin
- B More sweat is produced
- C More blood flows through the skin
- D More heat is lost from the skin

- 91. Regular exercise helps to improve overall health, quality of life and fitness. It also helps to reduce the risk of chronic conditions like all below, except ...
- A type 2 diabetes
- B type 1 diabetes
- C obesity
- D heart diseases
- 92. Which difference between aerobic and anaerobic exercises is incorrect?

	Aerobic exercise	Anaerobic exercise
А	Requires the	Does not require the
	presence of oxygen	presence of oxygen
В	Gentle, rhythmic	High intensity activity
	activity	
С	Increase muscle	Increase endurance
	mass and strength	and stamina
D	Longer duration	Shorter duration

QUESTIONS 93, 94 AND 95 ARE BASED ON THE GRAPH BELOW.

The graph shows the effects of eating many small meals and eating fewer large meals on blood glucose and insulin concentrations in a normal person.

The arrows on the graphs below indicate when meals were eaten. The normal blood glucose concentration is 100mg/dl.



93. What happens to the blood glucose concentration immediately after a meal is eaten? The level ...

- A increases above the blood insulin concentration
- B stays the same
- C decreases and then increases
- D decreases below the blood insulin concentration
- 94. What does not happen to the blood insulin concentration when eating fewer larger meals?
- A The maximum blood insulin concentration is higher, between 160-180 mg/dl
- B Blood insulin concentration rises and falls six times a day
- C The insulin concentration drops below the minimum glucose concentration
- D The minimum blood insulin concentration is lower, between 20-30 mg/dl
- 95. Why is it better for a diabetic person to eat many smaller meals per day than eating fewer large meals?
- A The glucose fluctuations are less extreme when smaller more frequent meals are eaten
- B More glucose will enter the bloodstream when eating smaller meals
- C More insulin will be needed when eating many smaller meals to return blood glucose levels to normal
- D The glucose fluctuations are more extreme when smaller more frequent meals are eaten

QUESTIONS 96, 97 AND 98 REFER TO THE GRAPH AND INFORMATION BELOW.

The graph illustrates the effect of BMI [Body Mass Index] and smoking on subfertility in females. Some women take longer to fall pregnant compared to others. A woman with a normal, fertile male partner, who takes longer than 12 months to fall pregnant is said to be subfertile.



A total of 2 587 women between the ages of 20 and 30 participated in the investigation and 1510 were subfertile. All the women were at least 20 weeks pregnant, had planned their pregnancies and fell pregnant naturally. Their height, mass, time taken to fall pregnant [in months] and smoking habits were obtained.



96. Why were the women asked for their height and mass?

- A To calculate their BMI
- B To find out if they are underweight
- C To find out if they are of normal weight
- D To find out if they are obese

97. How many of the women were subfertile smokers with a BMI ≥ 30?

- A 441
- B 257
- C 106
- D 619

98. Based on the information in the graph, what advice should be given to women who want to increase their chances of falling pregnant?

- A Do not smoke if your BMI is \geq 30
- B To gain weight if your BMI is ≤ 20
- C It is all right to smoke if your BMI is ≥ 30
- D To lose weight if your BMI is between 20-24,9

99. Which of the following is NOT a reflex action?

- A Sneezing
- B Coughing
- C Chewing
- D Yawning

100. Which of the following is TRUE of the rate of contraction of the human heart? It will ...

- A decrease temporarily when drinking too much alcoholic drinks
- B increase temporarily when sleeping
- C decrease temporarily when hiking up a steep mountain
- D increase temporarily when you suddenly see someone you like

~ End~