

SOUTH AFRICAN AGENCY FOR SCIENCE AND TECHNOLOGY ADVANCEMENT

58th LIFE SCIENCES OLYMPIAD

GRADES 10 -12

2023

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.

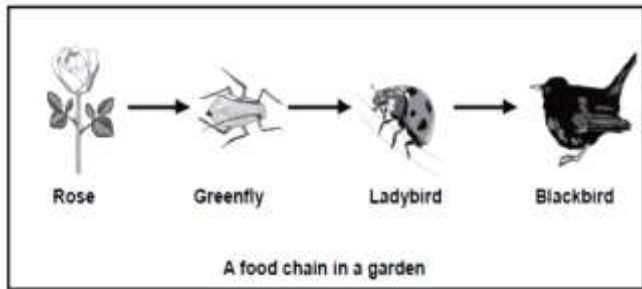
To avoid disqualification - You are required to complete **all** the information requested on the answer sheet. Please complete the information in script, as well as shade the corresponding blocks. If the corresponding blocks are not shaded appropriately, your results will be returned without a name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

Three hours are allowed to answer the questions

1. The basic unit of life is a

- A nucleus
- B cell
- C zygote
- D nucleolus

QUESTIONS 2 AND 3 are based on the diagram below which represents a food chain in a garden.



2. The blackbird in the diagram is a

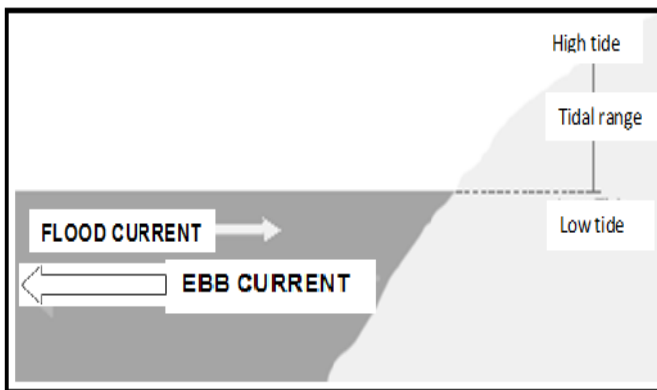
- A predator
- B herbivore
- C producer
- D primary consumer

3. If all the greenflies in this garden were removed, what would happen to the population of ladybirds?

- A It will decrease
- B It will stay the same
- C It will increase
- D Nothing will happen

4. Tides originate in the oceans and progress toward the coastlines where they appear as the regular rise and fall of the sea surface.

The diagram below shows how flood current and ebb current change tidal range.



Which ONE of the following statements is CORRECT?

- A As the tide rises water moves away from the shore. This is called a flood current.
- B As the tide recedes water moves away from the shore. This is called an ebb current
- C As the tide rises water moves toward the shore. This is called an ebb current.
- D As the tide recedes water moves toward the shore. This is called an ebb current

5. The size of the elephant's ears is especially important to ...



- A cool the body down
- B improve hearing
- C balance the large body
- D protect the head

6. The list below are factors that may affect a habitat:

- (i) Mining
- (ii) Poor agricultural practices
- (iii) Reforestation
- (iv) Urbanisation
- (v) Conservation

Which combination of the factors can lead to habitat destruction?

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

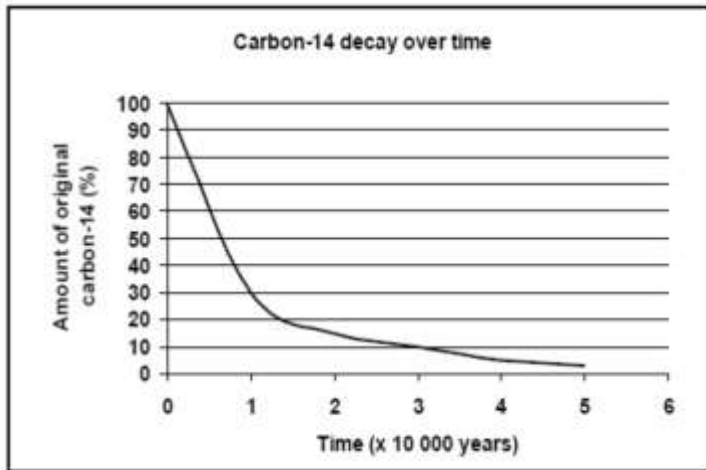
7. Transgenic plants are plants that have ...

- A genes of another organism inside them.
- B no genes of other organisms inside them.
- C many genes with no known functions.
- D many genes that code for the same proteins.

8. Which ONE of the following shows the results when a cell with 20 chromosomes undergoes MITOSIS?

	NUMBER OF DAUGHTER CELLS	NUMBER OF CHROMOSOMES
A	2	20
B	2	10
C	4	20
D	4	10

9. Timothy wants to determine the age of a fossil snail. One way to determine the age of a fossil is to use the rate of decay of carbon-14. The graph below shows how carbon-14 decays over time.



A fossil snail was found to have 30% of its carbon-14 remaining. According to the above graph, Timothy can conclude that the age of the fossil is approximately

- A 5 000 years
- B 15 000 years
- C 10 000 years
- D 20 000 years

10. Which of the following will take place in the arm while lifting food from the plate to the mouth?

- A Triceps and biceps contract.
- B Triceps contract and biceps relax.
- C Biceps and triceps relax.
- D Biceps contract and triceps relax.

11. Load shedding (which is caused by an imbalance between electricity available and the demand for it) is so much part of our daily lives, that it is difficult to imagine how life was before it was introduced to us.

Why is load shedding done in South Africa?

- A To increase reliance on coal fired power plants
- B To improve the electricity supplied to all people and companies
- C To ensure efficient operation of all electricity equipment
- D To reduce the peak demand for electricity on the electricity systems

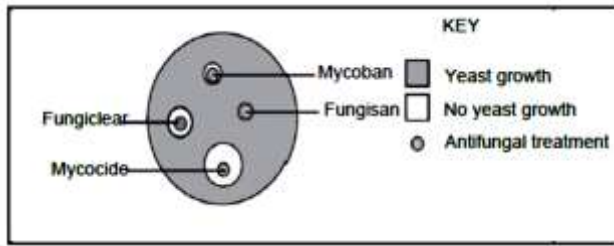
12. Which of the following is NOT a national symbol of South Africa?

- A Blue Crane
- B Galjoen
- C Springbok
- D Rose

13. Which ONE of the following combinations of soil types shows an INCREASE in the water holding capacity from left to right?

	Soil types		
A	sand	clay	loam
B	clay	sand	loam
C	sand	loam	clay
D	clay	loam	sand

14. Scientists carried out an investigation to test the effectiveness of four antifungal treatments on preventing the growth of yeast. The results are shown in the diagram below.



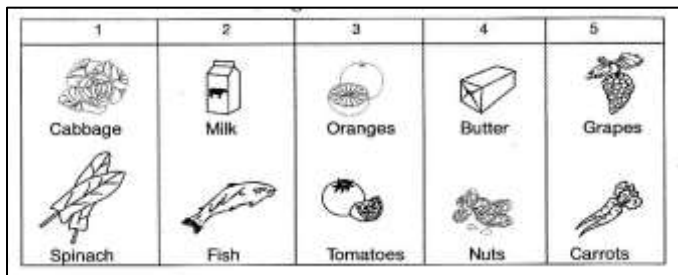
Which ONE of the following conclusions can be made from the results?

- A All the antifungal treatments are equally effective.
- B All the antifungal treatments are ineffective.
- C Mycocide is the most effective and Fungisan is the least effective.
- D Fungisan is the most effective and Mycocide is the least effective.

15. When green plants photosynthesise, they produce complex organic compounds. This process involves

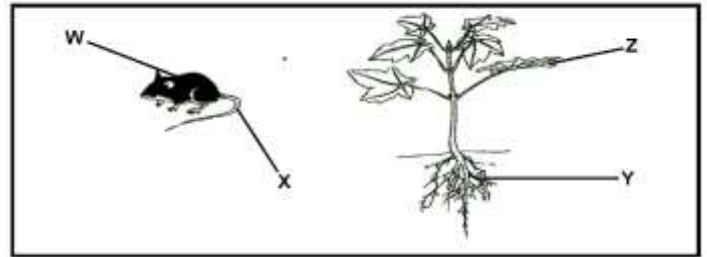
- A radiant energy being converted into kinetic energy.
- B heat energy being converted into and stored as chemical energy.
- C radiant energy being converted into and stored as chemical energy.
- D chemical energy being converted into and stored as radiant energy.

16. Cheryl's toddler suffers from rickets, which is a bone deformity in young children. Which foods below could she have included in the diet of her toddler to prevent this disorder?



- A 2
- B 3
- C 4
- D 5

17. In which part/s of the living organisms below are fuel molecules broken down to gradually release energy?



- A Z only
- B W and X only
- C Z and Y only
- D W, X, Y and Z

18. Jenny is 25 years old, with no children and wants to start using a contraceptive. Which of the following is NOT the characteristic of an ideal contraceptive for Jenny?

- A Irreversible
- B Easily available
- C User-friendly
- D Effective with the least side-effects

QUESTIONS 19 AND 20 refer to the table below which shows the distribution of blood (in ml/min) to different organs at rest and during strenuous exercise.

ORGAN	AMOUNT OF BLOOD AT REST (ml/min)	AMOUNT OF BLOOD DURING EXERCISE (ml/min)
Brain	750	750
Heart	250	850
Skeletal muscle	1 200	12 500
Skin	500	2 000
Kidney	1 100	650
Abdomen	1 400	650
Other	800	600

19. The brain receives 750ml of blood per minute during rest and after exercise. How many cups of blood is this? (1cup = 250 ml)

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

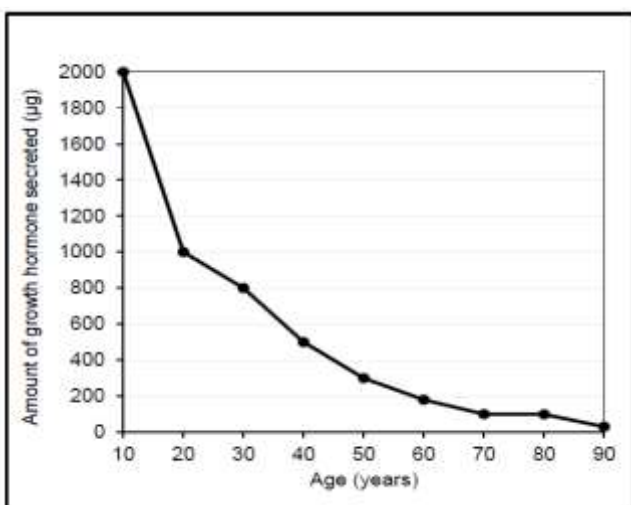
20. The skeletal muscle receives most blood during exercise because ...

- A less blood flows to the abdomen during exercise.
- B the respiration rate of the muscle cells decrease.
- C the muscle cells need more oxygen to produce more energy.
- D less blood flows to the kidney during exercise.

21. Which one of the following collections of organisms can be regarded as a population in the Kruger National Park?

- A Beetles, flies, butterflies, moths
- B Grass, buck, lions
- C Termites in a termite nest
- D Plants, Locusts, frogs, snakes

22. Brian wanted to know the relationship between the secretion of growth hormone and age. He studied the graph below and came to a conclusion.



A suitable conclusion that he made is that ...

- A growth hormone is not secreted after the age of 50 years.
- B the amount of growth hormone secreted decreases with age.
- C the amount of growth hormone secreted increases with age.
- D the amount of growth hormone secreted is not affected by age.

23. A scientist did an investigation on some healthy individuals to determine the effect of drinking water on urine production.

Which ONE of the following CORRECTLY indicates the independent and dependent variables?

	INDEPENDENT VARIABLE	DEPENDENT VARIABLE
A	The amount of urine produced	Time in hours
B	The amount of water drunk	The amount of urine produced
C	The amount of urine produced	The amount of water drunk
D	The people participating	Time in hours

24. What is the name of Africa's first cloned animal which was born in South Africa on 19 April 2003?

- A Snuppy the dog
- B Got the fighting bull
- C Dolly the sheep
- D Futhi the cow

25. Which ONE of these is the type of food that is mainly digested in the human stomach?

- A Carbohydrate
- B Fatty acid and glycerol
- C Nucleic acid
- D Protein

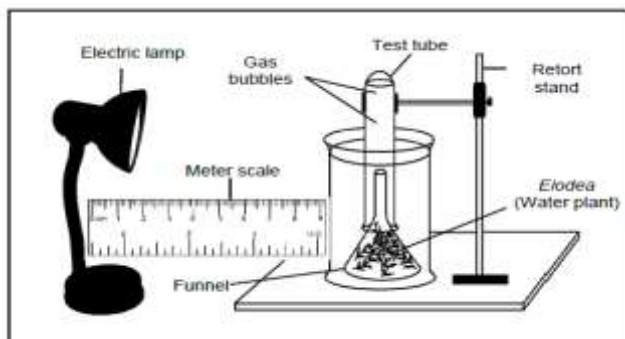
QUESTIONS 26, 27 AND 28 REFER TO THE INVESTIGATION BELOW:

Grade 11 learners conducted an investigation to determine the effect of light intensity on the rate of photosynthesis. They formulated a hypothesis as: *A decrease in the light intensity will increase the rate of photosynthesis.*

They proceeded as follows:

- *Elodea* plants were placed under a glass funnel in a beaker containing water
- A test tube containing water with no air bubbles was fitted over the glass funnel as shown in the diagram.
- After switching off all lights, a lighted table lamp was placed one metre away from the beaker.
- A meter scale was placed between the table lamp and the beaker.
- The number of air bubbles released by the plant in a one minute period was counted and recorded in the table below.
- The above steps were repeated at different light intensities

Apparatus used to determine the effect of light intensity on the rate of photosynthesis



The table below shows the number of bubbles released by the *Elodea* plant when different light intensities were placed at the same distance from the plant.

LIGHT INTENSITY (ARBITRARY UNITS)	NUMBER OF BUBBLES GIVEN OFF IN ONE MINUTE
1	8
2	28
3	105
4	105

26. We can conclude that the hypothesis is ...

- A not affected by the results
- B supported by the results
- C rejected by the results
- D not correctly stated

27. How was the dependent variable measured in this investigation?

- A By the meter scale.
- B By comparing the effects of the different light intensities.
- C By counting the number of bubbles released per minute.
- D By measuring the distance between *Elodea* and the light source.

28. What was the percentage increase in the number of bubbles when the light source was shifted from 1 to 2 arbitrary units?

- A 250 . 0%
- B 71,4%
- C 28,6%
- D 350 .0%

29. The following bones are found in the human body. Which bones are in the arm?

- A Humerus, fibula, tibia, tarsals, metatarsals, phalanges
- B Radius, ulna, fibula, tarsals, metatarsals, phalanges
- C Humerus, radius, ulna, carpals, metacarpals, phalanges
- D Tibia, radius, ulna, carpals, metacarpals, phalanges

30. The table below compares the rate of extinction of mammal species over two different time periods.

TIME PERIOD (YEARS)	RATE OF EXTINCTION PER 100 YEARS
1500-1900	4.5
1900-2000	90

What is the ratio between the rate of extinction from 1500 to 1900 compared to the ratio of extinction from 1900 to 2000?

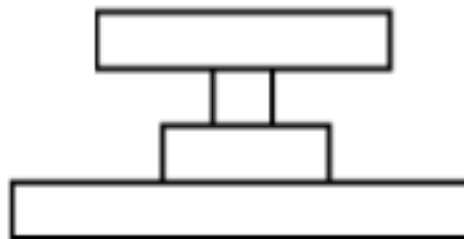
- A 1 : 2
- B 1 : 20
- C 2 : 1
- D 20 : 1

QUESTIONS 31 AND 32 ARE BASED ON THE AGES OF PREGNANT WOMEN AND THE CHANCES OF THEM HAVING MISCARRIAGES.

AGES OF WOMEN	PREGNANCIES PER MONTH (%)	CHANCES OF MISCARRIAGE (%)
22	25	10
28	24	11
34	18	15
40	6	24
46	2	53

31. Which ONE of the following is the correct relationship between the ages of women and the chances of miscarriage?
- A The age of the women has no effect on the chances of miscarriage
 B The older the women gets the greater the chance of miscarriage
 C The older the women gets the lower the chance of miscarriage
 D Younger women have a greater chance of miscarriage
32. In a particular month during this investigation 25 500 women fell pregnant. How many in this particular month, would be aged 28 according to the data in the table above?
- A 4590
 B 6120
 C 2805
 D 6375
33. The monomers of starch, lipids and haemoglobin are respectively called ...
- A glucose; fatty acids and glycerol; amino acids
 B amino acids; fatty acids and glycerol; glucose
 C glucose; amino acids; fatty acids and glycerol
 D amino acids; glucose; fatty acids and glycerol
34. Which of the following is a CORRECT definition of meristematic 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 cell in a plant
 D Cells that divide uncontrollably and continually resulting in the formation of swellings

35. The diagram below shows a pyramid of numbers.

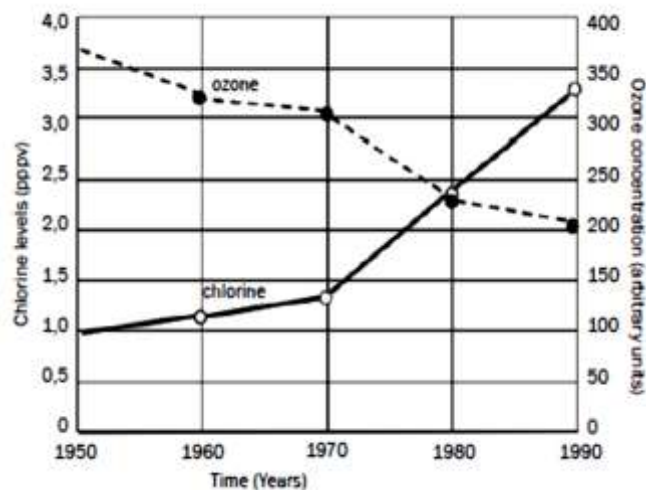


Which ONE of the food chains below is CORRECTLY represented in the diagram?

- A Grass → rabbits → foxes → tiger
 B Thorn tree → beetles → lizards → owl
 C Dead leaves → worms → sparrow → fleas
 D Grass → cow → ticks → tick-bird

QUESTIONS 36 AND 37 REFER TO THE INVESTIGATION AND GRAPH BELOW.

An investigation was done to measure the ozone concentration and the chlorine levels in Antarctica since 1950. The results are shown in the graph below.



36. Identify the correct caption for the graph.

- A Changes in the levels of ozone and chlorine.
 B Changes in the levels of ozone and chlorine in Antarctica
 C Chlorine levels versus ozone concentration
 D Changes in the levels of chlorine and ozone concentrations from 1950 to 1990

37. In which 10-year period was the ozone depletion the greatest?

- A Between 1950 and 1960
- B Between 1960 and 1970
- C Between 1970 and 1980
- D Between 1980 and 1990

38. Which of the following activities will lead to an INCREASE of carbon dioxide in the atmosphere?

- A Reuse and recycling of shopping bags
- B Using public transport or bicycles
- C Reforestation
- D Deforestation

39. What is the visible glowing surface of the sun called?

- A photosphere
- B atmosphere
- C chromosphere
- D stratosphere

40. *Hoodia gordonii* is an indigenous, succulent plant that has been widely used for generations by the San people of the Kalahari

- A as an appetite suppressant and thirst quencher
- B as a laxative
- C to increase the body's natural resistance to disease
- D as a treatment for joint pain caused by arthritis and gout

41. The list below is strategies that may affect our indigenous plants.

- I Education campaigns on the impact and consequences of over-exploitation
- II Any number of plants can be harvested
- III Limit the size of the plants harvested
- IV Legislation to control harvesting
- V Do not replace harvested plants
- VI No permit required to harvest plants

Which combination of strategies will prevent an over-exploitation of our indigenous plants like the *Hoodia gordonii*, in South Africa?

- A I, III and IV only
- B I, IV and VI only
- C I, III and V only
- D II, IV and VI only

42. A testable prediction about what you expect to happen in a study is ...

- A a theory
- B a hypothesis
- C a law
- D an observation

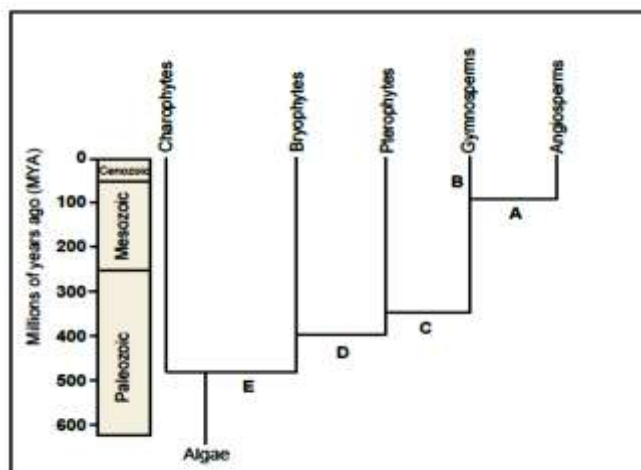
43. Which row in the table CORRECTLY pairs a human activity with its impact on the environment?

	HUMAN ACTIVITY	IMPACT ON ENVIRONMENT
A	Increase in the human population	Reduction in water usage
B	Decrease in the use of pesticides	Erosion of rock in soil
C	Decrease in recycling	Reduction in amount of available resources
D	Increase in housing developments	Improvement in air quality

44. Which of the following is NOT a benefit of nuclear energy?

- A There is plenty uranium in the Earth's crust.
- B Nuclear power does not cause acid rain or global warming.
- C Very little uranium is needed to produce a huge amount of energy.
- D It produces highly toxic radioactive waste, which is stored in thick steel drums.

QUESTIONS 45 AND 46 REFER TO THE PHYLOGENETIC TREE/CLADOGRAM BELOW.



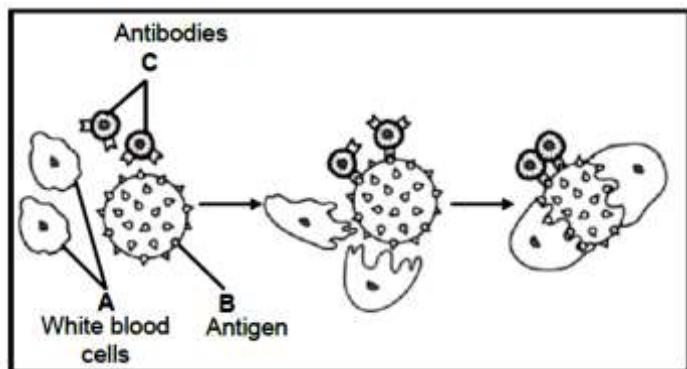
45. How long ago did the **FIRST** seed-bearing plants arise on earth?

- A 100 MYA
- B 450 MYA
- C 550 MYA
- D 350 MYA

46. Which letter on the phylogenetic tree represents evolution of fruit bearing organism?

- A B
- B A
- C E
- D C

47. Kyra had a COVID-19 vaccine. The diagram below illustrates activities taking place in her body after her vaccination.



Based on the diagram, the vaccination stimulated her body to produce more of ...

- A structure A only.
- B structure B only.
- C structures A and C only.
- D structures A, B and C.

48. The amount of light emitted by an object in a unit of time is known as ...

- A radiation
- B luminosity
- C convection
- D starlight

49. Study the list of evolutionary events below that took place on the Earth:

- I Rapid evolution and spread of mammals
- II Photosynthetic bacteria (prokaryotes) evolved
- III Unicellular eukaryotic organisms evolved
- IV Accumulation of oxygen in the atmosphere

The correct sequence of events from the earliest to the latest that took place is ...

- A IV, II, I and III
- B I, II, III and IV
- C IV, III, II and I
- D II, IV, III and I

QUESTIONS 50 AND 51 REFER TO THE GRAPH AND TABLE BELOW:

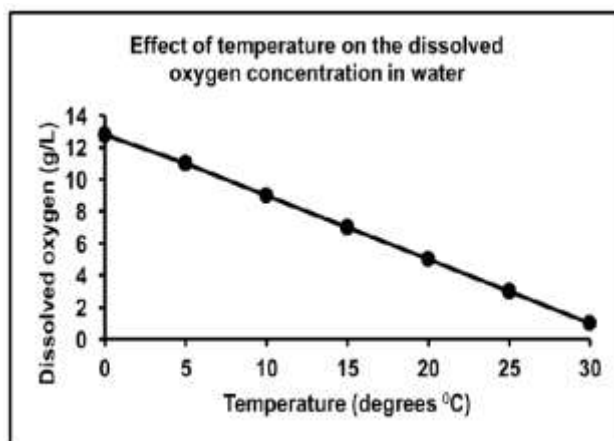


Table of oxygen requirements of different organisms in a river

Animal	Striped Bass	Shad	Yellow perch	Clams	Blue Crab	Spot fish	Worms
Minimum oxygen requirements (mg/L)	6	5	5	4	3	2	1

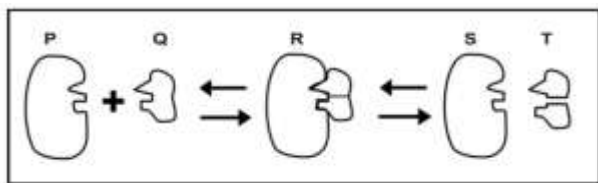
50. The above graph indicates that at a temperature of 15°C, the river's levels of dissolved oxygen in g/L would be

- A between 6 and 8
- B between 8 and 10
- C between 8 and 12
- D between 4 and 6

51. Due to the release of water from a factory, the temperature of water in a stream is 30°C. Two organisms that are likely to be found living in the stream are

- A striped bass and blue crab
- B worms and clams
- C worms and spot fish
- D yellow perch and spot fish

52. The diagram below shows how an enzyme functions.



Labels P, Q, R and T are respectively the ...

- A Enzyme, product, enzyme-substrate complex and substrates.
- B Product, enzyme, substrate and enzyme-substrate complex
- C Substrate, enzyme, product and enzyme-substrate complex.
- D Enzyme, substrate, enzyme-substrate complex and products.

53. Thorn decides to test the effect of the salt concentration on the activity of his tropical sea fish. He has two tanks. One he fills with normal sea water and the other with a mixture of 80% sea water and 20% fresh water.

His procedure was as follows:

- I Conducted the investigation and recorded the results.
- II Decided on date, time and place to do the investigation.
- III Repeated the investigation five times.
- IV Decided on the factors that need to be kept constant.

Which combinations of the procedure are considered as *planning steps*?

- A II and IV only
- B III and IV only
- C I, II and III only
- D I and II only

54. The table below shows differences between plant and animal cells. Which comparison is **INCORRECT**?

	PLANT CELL	ANIMAL CELL
A	Large vacuole	Small or no vacuole
B	Cell membrane present	No cell membrane
C	Cellulose cell wall present	No cellulose cell wall
D	Chloroplasts present	No chloroplasts

55. When DNA evidence is used in a court of law it is called ...

- A transcription
- B forensics
- C replication
- D genetic engineering

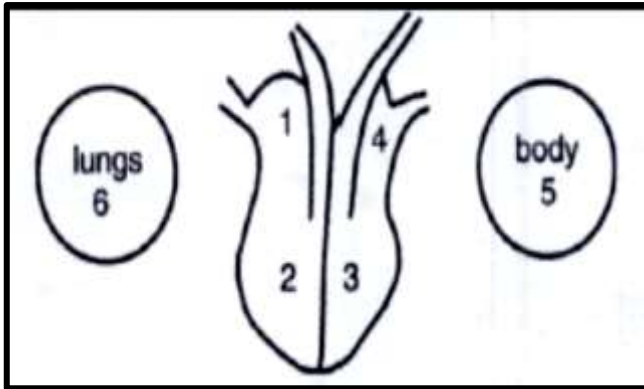
56. Why does a teenage boy need more protein in his diet than an adult male?

- A The boy must prevent a deficiency disease called ketosis .
- B The boy is still growing and needs the amino acids for muscle development.
- C Adult males have more lean muscles than teenage boys
- D The boy must prevent bone damage.

57. What is the smallest planet in the solar system by mass?

- A Mercury
- B Jupiter
- C Mars
- D Earth

58. The diagram below shows the human heart. Use ALL the NUMBERS to show the CORRECT sequence of blood circulation through the heart.



- A 4, 6, 2, 1, 3, 5
 B 2, 6, 4, 5, 3, 1
 C 1, 2, 5, 3, 4, 6
 D 3, 5, 1, 2, 6, 4

59. There is a lung condition that causes shortness of breath and one of the factors that increase your risk of developing this condition is smoking.

This lung disease is known as ...

- A asthma
 B emphysema
 C bronchitis
 D cystic fibrosis

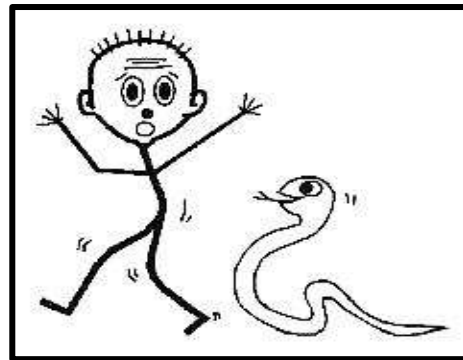
60. Desert biomes have low, sparse vegetation. Plants there are structurally suited for water conservation.

Which THREE of the following leaf modifications are effective ways in which these plants conserve water?

- I Large, broad leaves
 II Thin cuticles
 III Thick, waxy cuticles
 IV Hairy leaves
 V Small or no leaves

- A I, II and IV
 B I, III and IV
 C II, IV and V
 D III, IV and V

61. What will the effect on the body be in the event shown in the diagram?



- A rate of heartbeat decreases.
 B blood pressure drops.
 C level of blood glucose increases.
 D blood flow to the skin increases.

QUESTIONS 62 AND 63 REFER TO THE PRODUCTION OF INSULIN AS DESCRIBED BELOW.

Scientists are using biotechnology to produce human insulin. A ring of DNA (plasmid) is taken from a bacterial cell to produce insulin. The steps which follow are NOT in the correct sequence.

- The gene for insulin is removed from a cell of a human pancreas.
- The bacteria make clones of them and produce insulin.
- The insulin gene is put into the bacterial plasmid and into a new bacterial cell.
- The bacterial plasmid is cut using enzymes.

62. Name the disorder that is treated using the insulin produced by bacteria.

- A Diabetes
 B Osteoporosis
 C Hypertension
 D Osteonecrosis

63. The CORRECT sequence of the steps to produce insulin is ...

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

64. Which of the statements regarding the washing powder in the advertisement below is CORRECT?

AN ADVERTISEMENT

BIO-CLASSIC WASHING POWDER**ENZYME ACTIVE**

**Gets rid of the most stubborn
protein stains!**

SAVE ELECTRICITY!

**Wash in cold water
(Max. 20°C)**

TAKE CARE!

Do not use in acidic water

This washing powder ...

- A will remove blood and meat stains
- B will function effectively in boiling water
- C function best at a low pH
- D will increase the activation energy of the process

65. Players from Ajax Cape Town soccer team usually get very tired in the last twenty minutes of their matches when they play Kaizer Chiefs in Gauteng. The correct reason why they become tired is ...

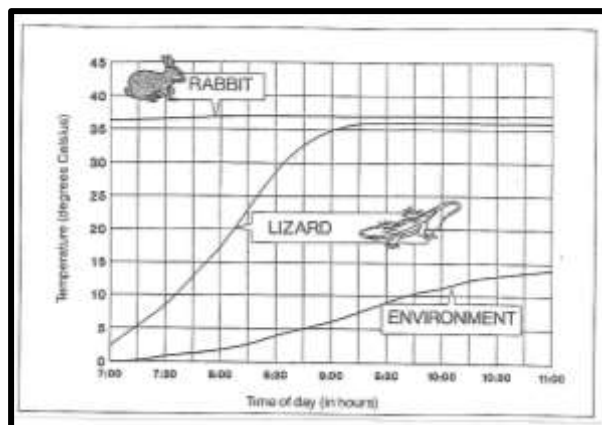
(Hint: Cape Town is at the coast and Gauteng is at a higher altitude)

- A there is less haemoglobin at higher altitudes.
- B the partial pressure of oxygen lowers at higher altitudes
- C the atmospheric pressure increases at higher altitudes.
- D haemoglobin has a higher affinity for oxygen at higher altitudes.

QUESTIONS 66, 67 AND 68 refer to the graph below

The graph shows the body temperatures of a lizard, a rabbit and the environment.

66. Why is the rabbit classified as an endothermic animal?



- A It can maintain a constant body temperature.
- B It cannot maintain a constant body temperature
- C Its body temperature fluctuates with the external environmental temperature.
- D At low temperatures it is less active.

67. What was the increase in temperature of the lizard between 7:00 and 9:00?

- A 2.5°C
- B 35°C
- C 36°C
- D 32.5°C

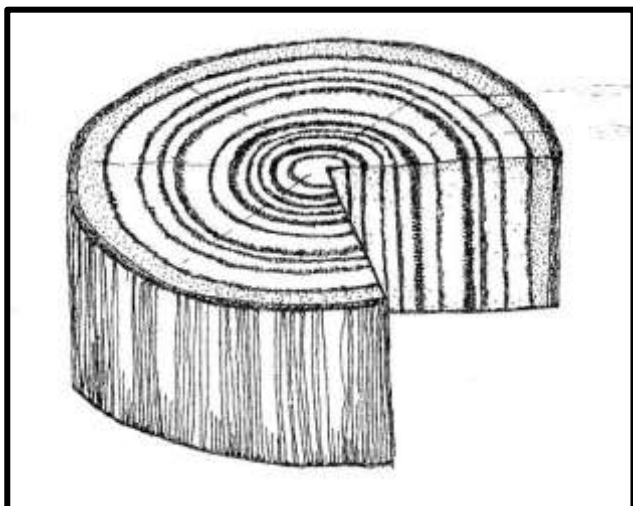
68. What behaviour pattern does the lizard exhibit early morning when the environmental temperature is low? It will make its skin ...

- A darker in colour and bask in the sun.
- B lighter in colour and crawl beneath a rock.
- C darker in colour and crawl beneath a rock.
- D lighter in colour and bask in the sun.

69. The sequence of the phases of MITOSIS is ...

- A metaphase, prophase, anaphase, telophase
- B prophase, anaphase, metaphase, telophase
- C telophase, prophase, anaphase, metaphase
- D prophase, metaphase, anaphase, telophase

70. The diagram below is a transverse section of a yellow wood tree.



The approximate age of the tree is ...

- A 7 years
- B 8 years
- C 10 years
- D 12 years

71. Study the statements on sexual reproduction below:

- I Offspring are genetically identical to the parent.
- II Offspring are genetically different from each other.
- III Only one individual is required for reproduction.
- IV Increases chances of survival.

Which combination of the above statements represent an advantage of sexual reproduction?

- A I and III only
- B II and III only
- C II and IV only
- D II, III and IV only

72. Fracking involves pumping large amounts of water underground at high pressure. This is used to get oil and gas from under the ground.

Environmentalists are concerned because ...

- A domestic production through fracking reduces foreign reliance on energy products.
- B much of the fracking process uses natural materials.
- C it can have negative impacts on communities and local habitats.
- D technologies exist to capture potential emissions.

73. A total blood pressure reading is determined by measuring the systolic and diastolic blood pressures.
A person with high blood pressure or hypertension may have a ...

- A systolic blood pressure of 120mmHg and diastolic pressure of 80mmHg.
- B systolic blood pressure less than 120mmHg or diastolic pressure less than 80mmHg.
- C systolic blood pressure more than 140mmHg or diastolic pressure more than 90mmHg.
- D systolic blood pressure of 125mmHg and diastolic pressure of 85mmHg.

74. Which of the following two-word items mean the same thing?

- A Leukemia - Haemophilia
- B Atrionector - Sino-Atrial node
- C Osteoporosis - Osteomalacia
- D Artherosclerosis – Arthritis

75. Radiation treatment works by making small breaks in the DNA inside cells.

Identify an INCORRECT statement:

These breaks prevent cancer cells from ...

- A growing
- B dividing
- C multiplying
- D dying

76. Sipho became '*antibiotic resistant*' after abusing antibiotics for a few years. What does it mean?

- A It means his body became resistant to the antibiotic.
- B It means the bacteria in his body became resistant to the antibiotic.
- C It means the viruses in his body became resistant to the antibiotic.
- D It means his antibodies became resistant to the antibiotic.

77. The blood that leaves the kidneys differs from the blood that enters the kidneys in that ...

- A it has more nitrogenous waste, more oxygen and less carbon dioxide.
- B it has less nitrogenous waste, less oxygen and more carbon dioxide.
- C it has more nitrogenous waste, less oxygen and more carbon dioxide.
- D it has less nitrogen waste, more oxygen and less carbon dioxide.

78. Global warming has resulted in the following change to the climate:

- A A drop in sea levels and coastal flooding.
- B Increased the biodiversity.
- C Frequent flooding and prolonged droughts.
- D Increased the production of different types of food.

79. Which one of these is NOT an advantage of fish species spawning at different times of the year?

- A It does not promote genetic diversity.
- B There is less crowding of the young.
- C There is less competition for food among larvae.
- D There are different foods available at different times of the year.

80. Mazda is producing hydrogen fuel vehicles for commercial use. Which of the following statements is NOT correct about the use of hydrogen as a fuel?

- A It is very expensive and time-consuming to produce hydrogen.
- B There are no poisonous emissions from the hydrogen fuel cell.
- C It requires processes like electrolysis of water for its production.
- D It is a very safe fuel to burn.

QUESTIONS 81 AND 82 REFER TO THE INFORMATION ABOUT WILD SUNFLOWER.

Sunflower has been cultivated (grown) by humans over several generations. During that time, certain characteristics were artificially selected. A comparison of some of the characteristics of wild sunflowers and cultivated sunflowers is given in the table below.

CHARACTERISTIC	WILD SUNFLOWER	CULTIVATED SUNFLOWER
Fruit weight	9–10 mg	55–65 mg
Plant height	150–170 cm	120–136 cm
Flower size (radius)	3–5 cm	9–11 cm
Number of branches	12–16	0
Leaf area	180–270 cm ²	300–315 cm ²

[Adapted from <http://journals.plos.org/plosone/article/figure/image>]

81. A possible reason for selecting sunflowers with a greater fruit weight is to

- A provide a greater yield of seeds.
- B improve the chances of fertilisation.
- C have genetic variation.
- D allow the plant to grow taller.

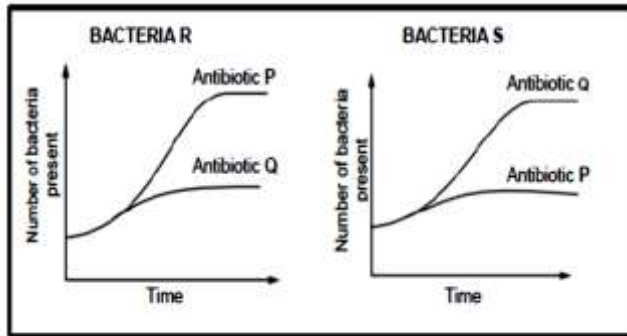
82. Below are possible reasons for selecting each characteristic:

- I A larger leaf area increases the rate of photosynthesis.
- II A shorter plant will result in more effective harvesting.
- III A larger flower will increase yield.
- IV More branches will increase flower yield.

Which combination gives the CORRECT reasons for the characteristics selected?

- A I, II, III and IV
- B II and III only
- C I, II and III only
- D I and IV only

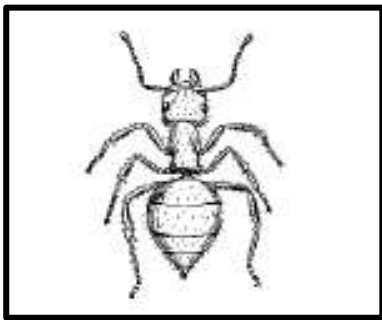
83. The graphs below show the effect of two antibiotics, P and Q on two different species of bacteria, R and S.



What conclusion can be drawn from the graphs?

- A Bacteria R is less resistant to antibiotic P than Q.
 B Bacteria R is more resistant to antibiotic P than Q.
 C Bacteria S is less resistant to antibiotic Q than P.
 D Antibiotic P is equally effective on bacteria R and S.

84. The animal represented below has the following characteristics:



- A Bilateral symmetrical, triploblastic, coelomate with an exoskeleton.
 B Radial symmetrical, diploblastic, acoelomate with a hydrostatic skeleton.
 C Bilateral symmetrical, triploblastic, coelomate with an endoskeleton.
 D Radial symmetrical, diploblastic, acoelomate with an exoskeleton.

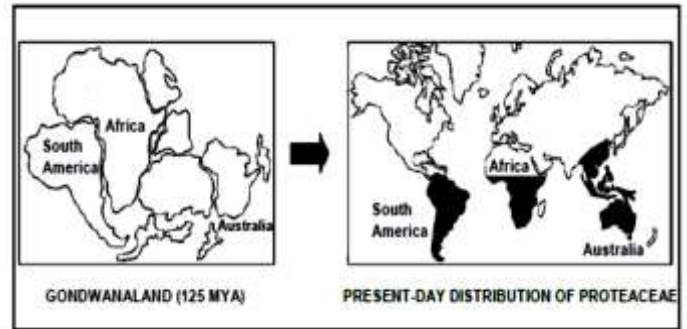
85. An investigation is reliable if ...

- A all the fixed variables are kept constant
 B it is neither too long nor too difficult to do
 C it does not have any content that wasn't taught specifically in the classroom
 D it is repeated many times and the average calculated

86. To which blood group are members described as universal donors?

- A Group AB
 B Group A
 C Group B
 D Group O

87. Shrubs of the Proteaceae (for example waratahs and proteas) can be found in Australia, South America, Indo-China and parts of Africa. The diagrams below show the distribution of members of the Protea family.



The CORRECT biological term for the study of the distribution of species is called ...

- A evolution
 B biogeography
 C continental drift
 D modification by descent

88. The body mass index (BMI) is a measure of a person's mass in relation to their height. To calculate a person's BMI, divide their weight (kg) by the square of their height (m²).

A person is classified as underweight if they have a BMI below 18. A person with a BMI of 18 to 25 is seen as having a normal weight. A person is considered to be overweight if they have a BMI between 25 and 30, and obese if their BMI is over 30.

Benjy is 1.70m tall and weighs 85kg. According to the information given he is classified as being ...

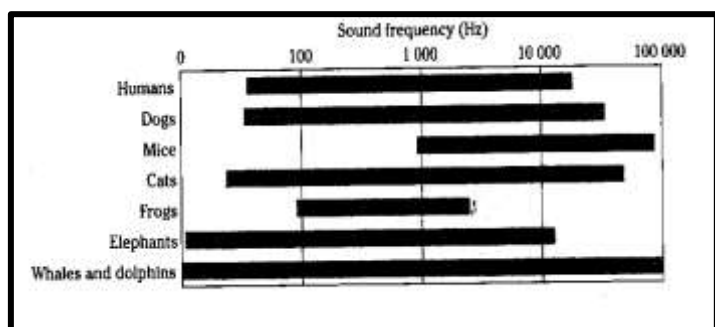
- A underweight
 B of normal weight
 C overweight
 D obese

89. Fossil fuels are similar to each other in that they all

...

- A were originally formed in marine environments.
- B contain the element carbon.
- C have undergone the same set of geological processes during their formation.
- D represent the remains of one living organism.

90. The graph below shows the hearing frequencies of different animals and humans.



Why do domestic animals often respond to noises that humans cannot hear?

- A They are smaller than humans.
- B They can run faster than humans.
- C They can hear lower frequency sounds than humans.
- D They can hear higher frequency sounds than humans.

91. Rabies is a viral disease spread to people by infected animals. A person bitten by an infected animal should be given an injection containing specific antibodies.

Following the injection, the person should have ...

- A artificial, active immunity
- B natural, passive immunity
- C artificial, passive immunity
- D natural, active immunity

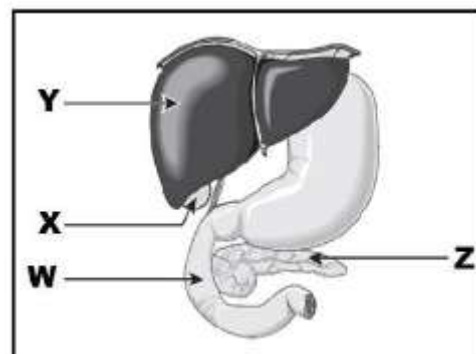
92. The following conditions are proposed as being favourable for the formation of fossils.

- I Organism should have a hard skeleton or shell
- II Micro-organisms must be present
- III The dead body must be covered by sediment fairly quickly
- IV Little or no oxygen must be present

Which one of the following combinations is most favourable?

- A I, II and III
- B II, III and IV
- C I, III and IV
- D II and IV

93. The diagram below represents part of the digestive system in humans.



Identify the **LETTER** of the organ that breaks down alcohol and heroin.

- A **W**
- B **X**
- C **Z**
- D **Y**

94. Can multicellular organisms rely on diffusion alone for transport and exchange of substances?

- A No, because large sizes of multicellular organisms result in a **small** surface area to volume ratio.
- B No, because large sizes of multicellular organisms result in a large surface area to volume ratio
- C Yes, because large sizes of multicellular organisms result in a **small** surface area to volume ratio
- D Yes, because large sizes of multicellular organisms result in a **large** surface area to volume ratio

QUESTIONS 95 AND 96 REFER TO THE EFFECTIVENESS OF POST EXPOSURE PROPHYLACTIC (PEP) DRUGS.

PEP drugs can be taken after exposure to HIV to prevent the virus from developing in a person.

The following table shows how effective Post Exposure Prophylactic (PEP) drugs are, if taken after different periods of exposure to the HI virus.

Period of exposure (hours)	0	24	72	76	96
Effectiveness (%)	100	100	52	0	0

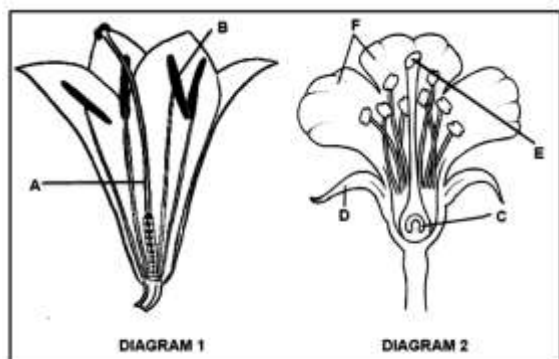
95. A nurse was accidentally pricked by the injection needle containing the blood of a HIV positive person. How effective would the PEP drugs be if she takes it 7 hours after exposure to the HI virus?

- A 100%
- B 0%
- C 52%
- D 50%

96. Lebo touched the blood of an injured rugby player with his bruised bare hands last Friday afternoon. On the advice of his parents he decided to see the family doctor, but he only did so on the following Tuesday. How effective will the PEP drug be?

- A 100%
- B 50%
- C 52%
- D 0%

QUESTIONS 97 AND 98 REFER TO THE TWO FLOWERS BELOW.



97. Where does pollination and fertilisation take place in Diagram 2?

	Pollination	Fertilisation
A	F	C
B	C	F
C	C	E
D	E	C

98. Why are these flowers NOT pollinated by the wind?

- A The petals are too large.
- B The filaments are not hanging outside the flower.
- C The stigmas are too small.
- D The stigmas are not feathery.

99. Which one of the following statements is TRUE regarding organ donation in South Africa?

- A People 65 years and older cannot be an organ donor.
- B Potential donor must register with the Organ donation foundation of South Africa
- C. You can pay to be ranked in a higher position on the organ transplant list.
- D If you are registered as an organ donor, doctors will not work as hard to save your life so that they can use your organs for transplant.

100. A good workout in the gym can make you feel great physically and emotionally, in part because of 'feel good' hormones released by our nervous system. These hormones include ...

- A endorphins
- B steroids
- C prostaglandins
- D leptins

~ End~