

**SOUTH AFRICAN AGENCY FOR SCIENCE AND TECHNOLOGY ADVANCEMENT**

**57<sup>th</sup> LIFE SCIENCES OLYMPIAD**

**GRADES 10 -12**

**2022**

**INSTRUCTIONS**

Please read the instructions carefully before answering the questions

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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.

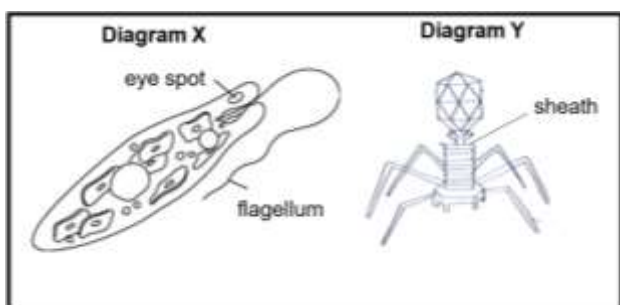
**To avoid disqualification** - You are required to complete **all** the information requested on the answer sheet. Please complete the information in script, as well as shade the corresponding blocks. If the corresponding blocks are not shaded appropriately, your results will be returned without a name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

Three hours are allowed to answer the questions

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1. A fat molecule is saturated if it ...
- A contains many hydrogen atoms and single bonded carbon atoms.
  - B contains many hydrogen atoms and at least one double bonded carbon atom.
  - C contains few hydrogen atoms with many double bonded carbon atoms
  - D contains few hydrogen atoms with at least a single bonded carbon atom.

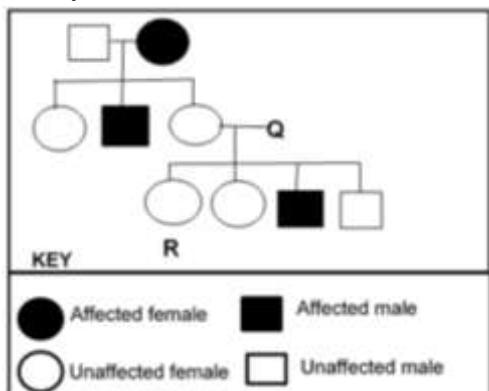
2. The basic structure of two microbes are represented in the diagram below.



- Which statement is CORRECT about the two diagrams?
- A X is a protist, Y is a bacterium
  - B X is a virus, Y is a fungus
  - C X is a bacterium, Y is a virus
  - D X is a protist, Y is a virus

**QUESTIONS 3 AND 4 ARE BASED ON THE INFORMATION ON THE PEDIGREE DIAGRAM BELOW**

Duchene muscular dystrophy is a recessive sex-linked genetic disorder that causes muscle weakness. The pedigree diagram below shows the inheritance of the disorder in a certain family.



3. The phenotype of individual Q is ...
- A unaffected male with a dominant allele
  - B unaffected male with a recessive allele
  - C affected male with a dominant allele
  - D affected male with a recessive allele

4. Using D for the dominant allele of the disorder, the possible genotype of individual R is ...

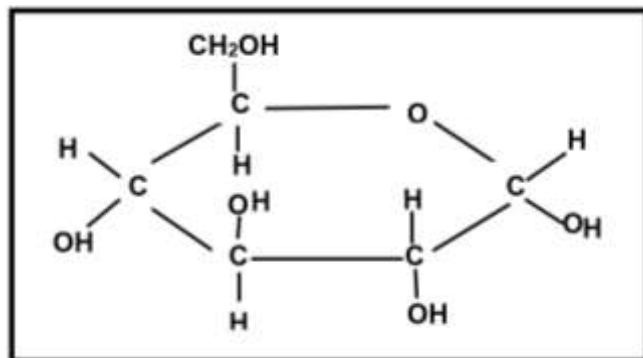
- A  $X^D X^D$  or  $X^D X^d$
- B  $X^D X^d$  only
- C  $X^D X^D$  or  $X^D X^d$
- D  $X^d X^d$  only

5. Which ONE of the following is TRUE for a person who has an underactive thyroid gland?

The TSH levels will be ...

- A high and the metabolic rate low.
- B high and the metabolic rate high.
- C low and the metabolic rate low.
- D low and the metabolic rate high.

6. Which organic compound has the basic structure shown below?



- A Nucleic acid
- B Carbohydrate
- C Protein
- D Fat

7. Any molecule that cells of the immune system specifically recognise as foreign is called ...

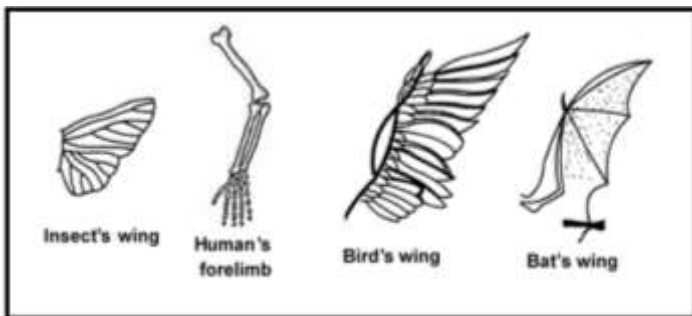
- A antibody
- B antigen
- C pathogen
- D virus

8. Which combination of the following structures is part of the human male reproductive system?

- (i) scrotum
- (ii) fallopian tube
- (iii) seminal vesicles
- (iv) ureter
- (v) testes

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

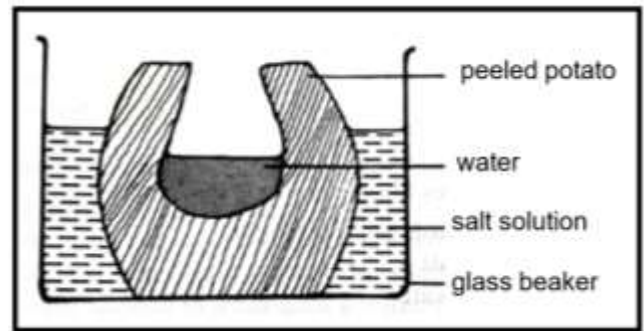
9. The diagram below shows some body parts in different organisms.



Which ONE of the following pairs is an example of a homologous structure?

- A Insect's wing and a human's forelimb
- B Human's forelimb and bat's wing
- C Bat's wing and insect's wing
- D Bird's wing and wings of insects

10. Grade 10 learners investigated the process of osmosis using the set up as shown in the diagram below.



How will the levels of water and salt solution change after several hours?

- A Water and salt solution levels will remain the same
- B Water level will increase and salt solution level will decrease
- C Water level will decrease and salt solution level will increase
- D Water level will decrease and salt solution level will remain the same

11. Which organism is the vector for Malaria?

- A Anopheles mosquito
- B virus
- C Plasmodium parasite
- D bacteria

12. Which ONE of the following is a consequence if the round window of the ear hardens?

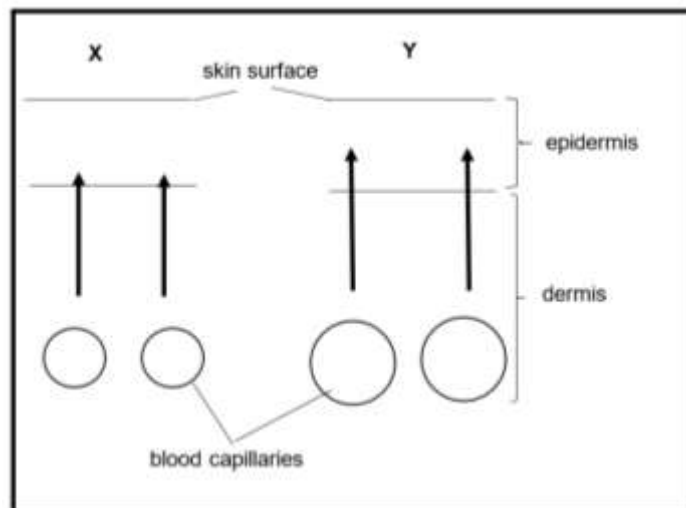
- A Pressure waves will be created.
- B Impulses will be transmitted to the brain.
- C Pressure between the outer and the middle ear will not be equalised.
- D An echo will occur and the sound will be distorted.

13. Two red-eyed fruit flies were mated and they produced 150 red-eyed flies and 48 white-eyed flies. From this information we can reasonably conclude that the ...
- A white-eyed condition is recessive and both parents are heterozygous.
- B red-eyed condition is dominant and both parents are red-eyed homozygous.
- C white-eyed condition is recessive and both parents are red-eyed homozygous.
- D red-eyed condition is recessive and both parents are heterozygous.
14. A group of similar cells combined to perform a common function is called an...
- A organism
- B organ
- C tissue
- D system
15. There is a need to reduce solid waste or find ways of managing it. The National Waste Management Strategies have identified the following strategies to reduce solid waste:
- (i) Recycling
- (ii) Treatment and disposal
- (iii) Recovery
- (iv) Avoidance and reduction
- (v) Re-use

Arrange the strategies in the ascending order of effectiveness using the numbers.

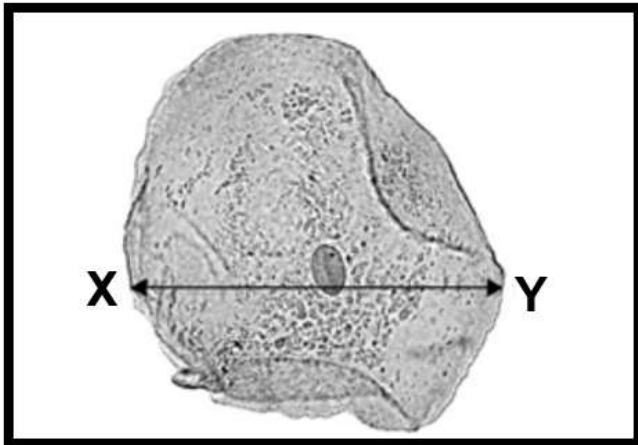
- A (iii) → (i) → (v) → (iv) → (ii)
- B (ii) → (iii) → (i) → (v) → (iv)
- C (ii) → (iii) → (i) → (iv) → (v)
- D (i) → (ii) → (iii) → (v) → (iv)

**QUESTIONS 16 AND 17 ARE BASED ON THE DIAGRAM BELOW SHOWING HOW THE SKIN BLOOD CAPILLARIES BEHAVE UNDER DIFFERENT ENVIRONMENTAL CONDITIONS, X AND Y. THE ARROWS REPRESENT HEAT LOSS.**



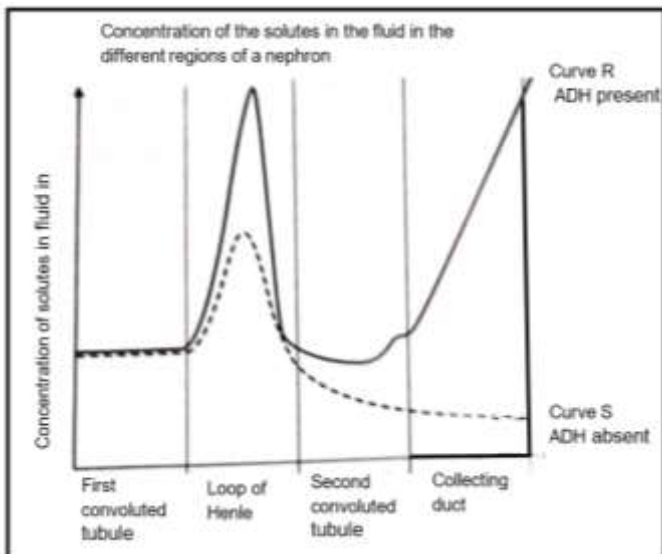
16. Under what environmental condition will the skin behave as shown in X?
- A Humid
- B Hot
- C Cold
- D Dry
17. Which ONE of the following correctly describes the regulation of body temperature in Y?
- A Decrease in diameter of blood capillaries, less heat loss and less sweat
- B Decrease in diameter of blood capillaries, more heat loss and more sweat
- C Increase in diameter of blood capillaries, more heat loss and more sweat
- D Increase in diameter of blood capillaries, more heat loss and less sweat
18. The manufacture of proteins in the cytoplasm using the message brought by the mRNA from the nucleus is ...
- A translation
- B ribosomal RNA
- C codons
- D transcription

19. The cheek cell in the diagram below is magnified 250 times. The width of the cell is shown by the line X to Y. Measure the width in (mm) and use the equation below to calculate the actual width of the cell.  
 Actual width =  $\frac{\text{Image size}}{\text{Magnification}}$



- A 0,10 mm
- B 0,12 mm
- C 0,14 mm
- D 0,16 mm

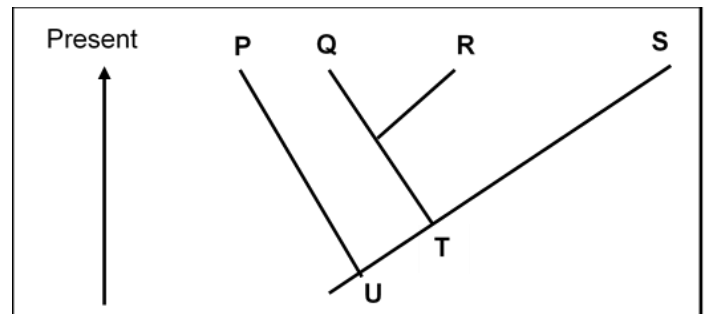
20. The graph below shows the concentration of solutes in the fluid in the different regions of a nephron from the human kidney. Curve R shows the concentration in the presence of the hormone ADH. Curve S shows the concentration in the absence of ADH.



Which ONE of the statements explains the difference in concentration of the fluid in the collecting duct in curves R and S?

	Curve R	Curve S
A	Permeability of collecting duct decreases	Permeability of collecting duct increases
B	Larger volume of more dilute urine produced	Smaller volume of more concentrated urine produced
C	Larger volume of more dilute urine produced	Smaller volume of more dilute urine produced
D	Smaller volume of more concentrated urine produced	Larger volume of more dilute urine produced

21. From the phylogenetic diagram below which statement is CORRECT?



- A Species U, T and S are extinct but species P, Q and R are existing
- B Species Q and R are more closely related than they are to species S
- C Species T is the common ancestor of all the other species
- D Species Q and R share a less recent common ancestor than the common ancestor they share with S

22. The table below shows the number of new TB cases recorded in 1994 and in 2004 from four different geographical regions in the world. These data exclude people who are HIV positive.

Year	Number of new TB cases per 100 000 of the population			
	Africa	Asia	Europe	South America
1994	148	629	48	98
2004	281	535	104	59

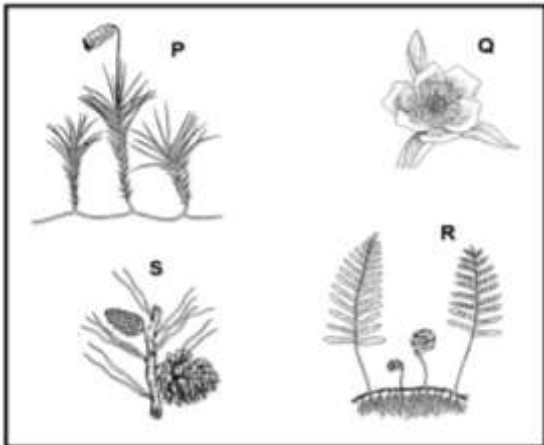
Describe a trend shown by the data between the two years.

- A Increase in number of new cases in Africa and Europe
- B Increase in number of new cases in Asia and South America
- C Decrease in number of new cases in Asia and Europe
- D Decrease in number of new cases in Africa and Europe

23. The CORRECT pathway of oxygenated blood from the lungs to the heart and to all the parts of the body is ...

- A Pulmonary artery → left atrium → left ventricle → aorta
- B Pulmonary vein → superior vena cava → right atrium → pulmonary artery
- C Inferior vena cava → right atrium → right ventricle → pulmonary artery
- D Pulmonary vein → left atrium → left ventricle → aorta

QUESTIONS 24 AND 25 ARE BASED ON THE DIAGRAM BELOW SHOWING THE MAJOR GROUPS OF THE KINGDOM PLANTAE.



24. In which group do members have the following characteristics?
- Lack specialised vascular tissue
  - Have dominant gametophyte
  - Fertilisation requires an outside source of moisture
  - Often found in moist locations

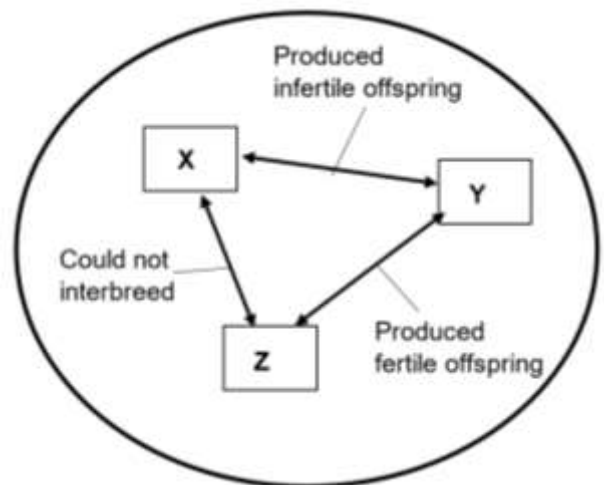
- A P
- B Q
- C R
- D S

25. The correct sequence in terms of INCREASING dependence on water for reproduction in the members of the diagram is ...

- A  $P \rightarrow Q \rightarrow R \rightarrow S$
- B  $Q \rightarrow S \rightarrow R \rightarrow P$
- C  $R \rightarrow P \rightarrow S \rightarrow Q$
- D  $S \rightarrow R \rightarrow Q \rightarrow P$

26. Scientists collected frogs from three different provinces in South Africa. They wanted to find out if the frogs from the three populations, X, Y and Z belong to the same species. They put the frogs together for a long time.

The diagram below shows the results of their investigation.



We can conclude that ...

- A All three populations are of the same species
  - B populations X and Y are of the same species but populations X and Z are different species
  - C populations Y and Z are same species but populations X and Z are different species
  - D Populations X and Y are same species but Y and Z are different species
27. The out of Africa hypothesis is supported by fossil evidence among others.

Which ONE of the following is CORRECT fossil evidence to support the hypothesis?

- A *Ardipithecus* and *Australopithecus* fossils have been found in Africa and other parts of the world
- B Fossils of *Homo habilis* have been found in Africa
- C The oldest fossils of *Homo sapiens* have been found in Africa
- D The youngest fossils of *Homo erectus* have been found in Africa

28. A researcher has discovered two species of mice that live in the same location. In the lab he is able to generate a viable hybrid by combining gametes from each species, however, no such hybrids exist in the wild.

Which ONE of the following methods of reproductive isolation might explain this phenomenon?

- A Infertile offspring
- B Species-specific courtship behaviour
- C Habitat isolation
- D Breeding at different times of the year

29. Which ONE of the following shows the correct placement of the carbohydrate in the table below?

	MONOSACC HARIDE	DISACCH ARIDE	POLYSACC HARIDE
A	sucrose	glucose	starch
B	galactose	lactose	cellulose
C	cellulose	starch	galactose
D	glucose	cellulose	lactose

30. If 10% of the bases in a molecule of DNA are adenine, what is the ratio of adenine to guanine in the same molecule?

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

31. The first and lowest layer of the atmosphere of the Earth is called ... ..

- A ionosphere
- B troposphere
- C stratosphere
- D thermosphere

32. Antarctica is a continent mostly covered by ice. Which combination of the statements below explains why the Antarctica is important to life on Earth?

- (i) It holds most of the world's fresh water
- (ii) It is a valuable benchmark for Climate Change.
- (iii) Antarctica environment and biosphere comprise highly sensitive indicators of present-day environmental changes.
- (iv) Key drivers of Earth's oceanic and atmospheric systems
- (v) Its ice absorbs most of the sun's rays.

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

33. In humans, blood returning to the heart from the vena cava goes to the ...

- A left ventricle
- B right ventricle
- C left atrium
- D right atrium

34. Study the following animals:

- (i) Spiders



- (ii) Snails
- (iii) Crabs
- (iv) Grasshoppers

Which combination of the animals belong to the phylum Arthropoda?

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

35. If the fossil record has few or no intermediate forms, if there are long periods in which the fossils underwent no morphological change, and if new forms arose very quickly, then evolution of these new forms would be best described as ...

- A Darwinism
- B Punctuated equilibrium
- C Lamarckism
- D Natural selection

36. About 77 percent of South Africa's primary energy needs are provided by ...

- A sun
- B fossil fuels
- C hydropower
- D wind

37. Which biome in South Africa has the highest biodiversity?

- A Savanna
- B Tropical Forest
- C Fynbos
- D Nama Karoo

38. Study the list of bones below:

- (i) Skull
- (ii) Sternum
- (iii) Humerus
- (iv) Scapula
- (v) Vertebral column

Which combination of bones are components of the axial skeleton in humans?

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

39. Which ONE of the following shows the CORRECT sequence in human nutrition?

- A Ingestion → digestion → absorption → assimilation → egestion
- B Digestion → ingestion → absorption → assimilation → egestion
- C Ingestion → digestion → egestion → assimilation → absorption
- D Ingestion → assimilation → digestion → absorption → egestion

40. Which statement would most likely be in agreement with Lamarck's theory of evolution?

- A Brown locusts have evolved in an area because they were better adapted to the environment and had high rates of survival and reproduction.
- B Most variations in animals and plants are due to gene mutations.
- C Geographical barriers may lead to reproductive isolation and a production of a new species.
- D Mice without tails will evolve because the tails of the mice of many previous generations were cut off.

41. The table below shows four characteristics Bongi and Naidoo gave about themselves.



	BONGI	NAIDOO
W	I am a girl	I am a boy
X	I am 160 cm tall	I am 158 cm tall
Y	I can roll my tongue	I cannot roll my tongue
Z	My blood type is AB	My blood type is B

Which statements describe the characteristics of discontinuous variation?

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

42. Which ONE of these is a TRUE statement?

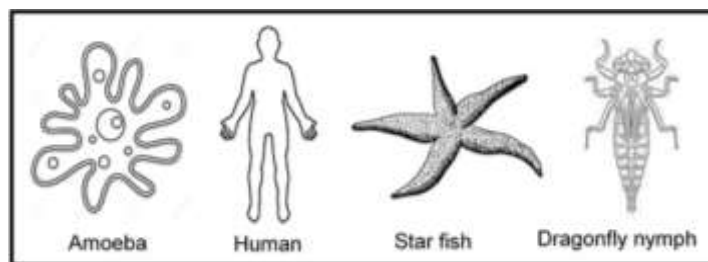
- A Reduction of fossil fuel burning will enhance the greenhouse effect  
 B Reduction of fossil fuel burning will lessen the greenhouse effect  
 C Global warming is so imminent that nothing can be done  
 D Global warming is of no immediate concern

43. Which ONE of the sequences of the cell cycle is CORRECT?

- A prophase → metaphase → interphase → telophase → anaphase  
 B interphase → anaphase → telophase → metaphase → prophase  
 C interphase → prophase → metaphase → anaphase → telophase  
 D prophase → anaphase → interphase → metaphase → telophase

44. Biologists classify animals according to body symmetry.

The diagram below shows different animals with various symmetries.



Identify which ONE of the following shows the correct symmetry of the organisms.

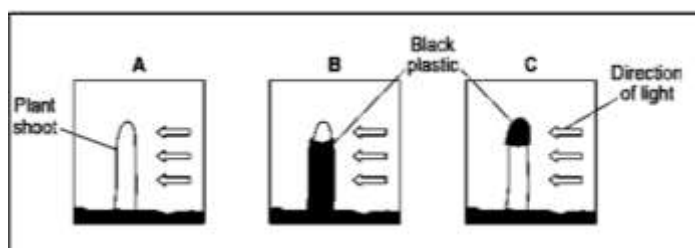
	AMOEBEA	HUMAN	STAR FISH	DRAGONFLY NYMPH
A	Bilateral	Radial	Asymmetry	Bilateral
B	Asymmetry	Bilateral	Radial	Bilateral
C	Radial	Asymmetry	Bilateral	Radial
D	Asymmetry	Bilateral	Radial	Asymmetry

**QUESTIONS 45 AND 46 REFER TO THE INFORMATION AND THE DIAGRAMS BELOW.**

Some learners investigated tropisms in plants. The learners:

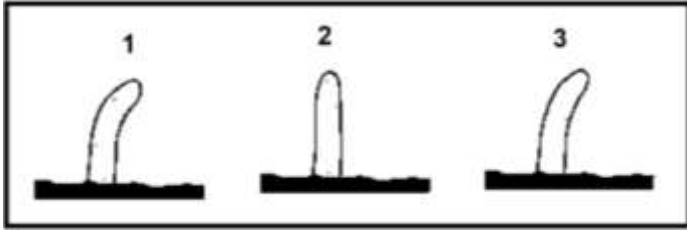
- Planted seeds and allowed shoot to grow
- Covered parts of some of the shoots with black plastic
- Placed the shoots in light coming from one direction
- Put boxes over the shoots to keep out other light

The diagrams below show how the investigation was set up.



Two days later the learners took off the boxes and black plastic covers, and observed the shoots.

The diagrams below show the results but in no specific order.



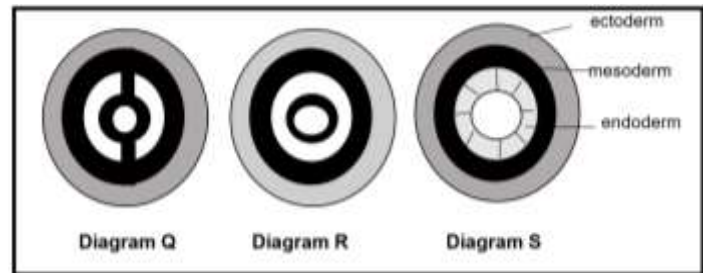
45. Which ONE of the following is the CORRECT matching of the investigative diagrams A, B and C and the results 1, 2 and 3?
- A B for 3 only  
 B A for 1 only  
 C B for 1 only  
 D C for 2 only
46. Name the type of growth movement the learners were investigating.
- A Tropism  
 B Geotropism  
 C Phototropism  
 D Thigmotropism
47. When homozygous, a particular allele of a locus in rats causes abnormalities of the cartilage throughout the body, an enlarged heart, slow development and death. This is an example of ...
- A polygenic inheritance  
 B pleiotropy  
 C epistasis  
 D codominance
48. Which combination of these are characteristics of all animals?
- (i) Heterotrophic  
 (ii) Have nervous coordination except for sponges  
 (iii) Reproduction  
 (iv) Photosynthetic
- A (i), (ii) and (iii) only  
 B (ii), (iii) and (iv) only  
 C (i), (iii) and (iv) only  
 D (i), (ii) and (iv) only

49. Which ONE of the following cells are closely associated with sieve tubes?
- A Vessels  
 B Tracheids  
 C Parenchyma  
 D Companion cells

**QUESTIONS 50 AND 51 ARE BASED ON THE FOLLOWING INFORMATION AND DIAGRAM.**

A coelom is a body cavity surrounding the digestive system. It provides a space for internal organs and can serve as a hydrostatic skeleton.

The diagram below shows different types of body cavities.



50. Which ONE of the following shows the CORRECT identification of each diagram?

	Q	R
A	Pseudo coelomate	True coelomate
B	True coelomate	Acoelomate
C	Acoelomate	Pseudo coelomate
D	True coelomate	Pseudo coelomate

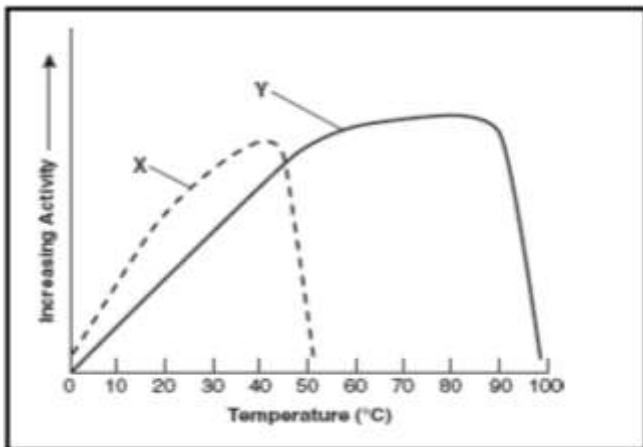
51. Flatworms (phylum Platyhelminthes) are ...
- A acoelomate and have bilateral symmetry  
 B pseudo coelomate and have radial symmetry  
 C acoelomate and have radial symmetry  
 D pseudo coelomate and have radial symmetry
52. The use of living things to make or change products or processes to satisfy human desires is referred to as ...
- A Recombinant DNA technology

- B Genetic modification  
 C Cloning  
 D Biotechnology

53. Which ONE of the following statements is a hypothesis?

- A Will increasing my cat's food increase her weight?  
 B Increasing my cat's food will result in an increase in her weight.  
 C I will feed my cat more food to increase her weight.  
 D Increasing my cat's food increased her weight

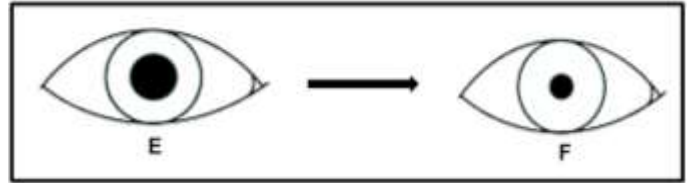
54. The graph below shows the effect of temperature on two enzymes, X and Y functioning in two different organisms.



At what temperature do the two enzymes have the same amount of activity?

- A 40 °C  
 B 45 °C  
 C 52 °C  
 D 85 °C

55. The diagram illustrates pupillary reflex.



Which ONE of the following conclusions is CORRECT?

- A Diagram E is viewing in bright light, the pupil is dilated  
 B Diagram E is viewing in dim light, the pupil is dilated  
 C Diagram F is viewing in bright light, the pupil is dilated  
 D Diagram F is viewing in dim light, the pupil is constricted

56. When a plasmid carries recombinant DNA into a recipient cell, the process ...

- A reduces genetic diversity  
 B is always dangerous  
 C allows production of proteins difficult to obtain by ordinary means  
 D requires that the donor DNA and the recipient cell be of the same species

57. What is the role of nitrogen-fixing bacteria in the nitrogen cycle?

- A They change ammonium to nitrate  
 B They return nitrogen (N<sub>2</sub>) to the atmosphere  
 C They transform nitrogen (N<sub>2</sub>) in the atmosphere to ammonium  
 D They withdraw nitrate from the soil

58. Which ONE of the following organelles contains its own DNA and plays an important role in converting food energy into usable cell energy?

- A Golgi apparatus
- B Mitochondria
- C Endoplasmic curriculum
- D Ribosomes

59. The following descriptions refer to one of the biomes in South Africa:

- The largest biome
- Altitude varies from sea level to 2000 m
- Average rainfalls of 230 mm to 1000 mm
- Almost every major geological soil type occurs
- Well developed over the Low-veld and Kalahari region

Which biome in South Africa can be described as above?

- A Grassland
- B Savannah
- C Fynbos
- D Forest

60. Study the descriptions below:

- (i) Conversion of solar energy to chemical energy occurs
- (ii) Carbon dioxide is a raw material
- (iii) The light-dependent stage occurs in the grana of the chloroplast
- (iv) The light-dependent stage occurs in the stroma of the chloroplast
- (v) Oxygen is a by-product

Which combination is CORRECT for photosynthesis?

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

61. Which sequence below is CORRECT with regard to the passage of light through the eye to form an image on the retina?

- A cornea → vitreous humour → lens → aqueous humour → retina
- B aqueous humour → cornea → lens → aqueous humour → retina
- C cornea → aqueous humour → lens → vitreous humour → retina
- D cornea → lens → vitreous humour → aqueous humour → retina

62. Study the list of Mendel's laws below:

- (i) Principle of segregation
- (ii) Principle of independent assortment
- (iii) Law of dominance

In a cross between a red-eyed fruit fly and a white-eyed fruit fly, all the F<sub>1</sub> offspring were red eyed. Which of the laws of Mendel can be used to explain this results?

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

63. A male with small testicles, long legs, wide hips, enlarged breasts, sparse body hair, and who is less muscular, most likely has:

- A Down syndrome
- B Jacobs syndrome
- C Turner syndrome
- D Klinefelter syndrome

64. The offspring of better adapted individuals are expected to make up a larger proportion of the next generation.

The most likely explanation is ...

- A Natural selection
- B Gene flow
- C Mutation
- D Genetic drift

65. Study the food chain: Grass → rabbits → snakes → hawks.

Which statement is TRUE according to the food chain?

- A Each population is omnivorous
- B Each predator population has a greater biomass than its prey population
- C Snakes are primary consumers
- D Each prey has a greater biomass than its predator population

66. The most common food digested in the human stomach is ...

- A nucleic acid
- B carbohydrate
- C protein
- D fat

67. The TWO main functions of pancreas are

- A to produce bile and detoxifies the blood
- B to remove poisons and to produce pepsin
- C contains endocrine glands that controls blood sugar and exocrine glands that help with digestion
- D contains exocrine gland control blood sugar and endocrine glands that help in digestion

68. The study of human evolution is termed as ...

- A palaeontology
- B palaeoanthropology
- C paleothermometer
- D parthenocarp

69. Barr bodies are ...

- A genetically active X chromosomes in males.
- B genetically inactive X chromosomes in females.
- C genetically active Y chromosomes in males.
- D genetically inactive Y chromosomes in males.

70. Trends in the evolution of plants include all of the following EXCEPT ...

- A from homosporous to heterosporous.
- B from less to more reliance on water for their life cycle.
- C from nonvascular to vascular.
- D from non-woody to woody.

71. Grade 10 learners investigated the rate of transpiration. They cut 4 leaves of the same size from the same plant and coated one or both surfaces with grease to prevent transpiration. The leaves were left in the laboratory for six hours.

The table below shows the results:

Leaf number	1	2	3	4
Surface coated with grease	None	Upper only	Lower only	Both
% decrease in mass	50	46	6	4

Using the above results determine which of the statements below is correct regarding the surface where the most transpiration happens.

- A Most transpiration happens from the upper surface only as coating the upper surface caused water loss similar to coating no surface at all
- B Most transpiration happens from the lower surface as coating the lower surface caused water loss similar to coating both surfaces
- C Most transpiration happens from the upper surface only as coating the lower surface caused water loss similar to coating both surfaces
- D Most transpiration happens from the lower surface as coating the upper surface caused water loss similar to coating no surface at all

72. The final digestive products of starch, lipids and proteins respectively are ...

- A glucose; fatty acids and glycerol; amino acids
- B amino acids; glucose; fatty acids and glycerol
- C fatty acids and glycerol; glucose; amino acids
- D amino acids; fatty acids and glycerol; glucose

73. The list below gives the characteristics of some young birds immediately after hatching.

- (i) Eyes are open
- (ii) Can move around
- (iii) Cannot feed themselves
- (iv) No feathers

Which ONE of the following combinations represents the characteristics of precocial development?

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

74. What can be used to treat people with coronary heart disease?

- A Vaccination
- B Antibiotics
- C Stent
- D Hormones

75. The flow of genetic information in a cell proceeds from ...

- A RNA to protein to DNA
- B DNA to RNA to protein
- C protein to DNA to RNA
- D RNA to DNA to protein

76. The typhlosole within the gut of an earthworm increases the surface area for nutrient absorption. This compares best to which of the organs in humans?

- A Teeth in the mouth
- B Oesophagus in the thoracic cavity
- C Villi in the small intestine
- D Rectum in the large intestine none of the above

77. A factor that impedes gaseous exchange in the human lung is ...

- A that the wall of the alveoli is moist.
- B that the alveolus is richly supplied with capillaries.
- C oxygen is in direct contact with alveolus.
- D ruptured walls of the alveoli

78. Which of the following pairs of animals are the result of convergent evolution?

- (i) Birds and bats
- (ii) Eagle and owl
- (iii) Snakes and burrowing lizards
- (iv) Cats and tigers
- (v) Dolphins and sharks

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

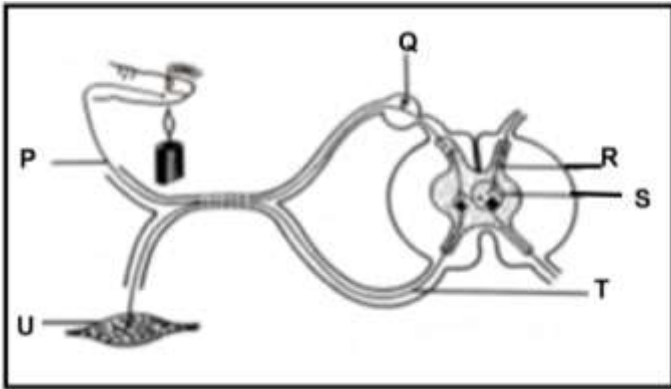
79. The Baobab tree in South Africa is ...

- A invasive
- B indigenous
- C alien
- D foreign

80. Rusts, ringworm, athlete's foot and thrush are examples of diseases caused by ...

- A bacteria
- B fungi
- C protists
- D viruses

81. The diagram below shows a reflex arc



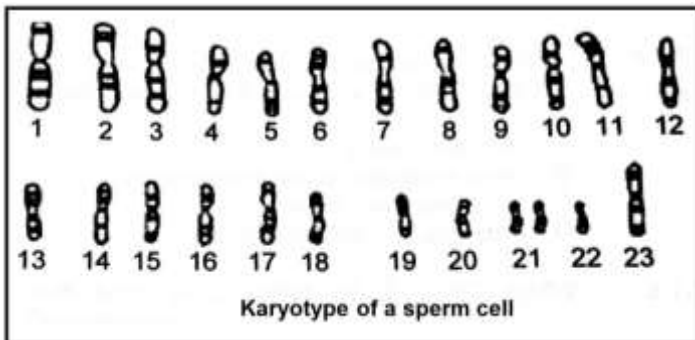
A person is able to feel pain but cannot react to the stimulus. Give the LETTER and NAME of the neuron that is damaged in this person.

- A U – muscle
- B T – motor neuron
- C Q – cell body
- D P – sensory neuron

82. Which TWO blood vessels carry deoxygenated blood?

- A Aorta and pulmonary artery
- B Coronary artery and pulmonary vein
- C Pulmonary artery and vena cava
- D Pulmonary vein and vena cava

83. The diagram below shows the chromosomes from a sperm cell.



How many autosomes are present in the sperm cell shown?

- A 24
- B 23
- C 22
- D 21

84. Which means of birth control is most effective in preventing sexually transmitted diseases?

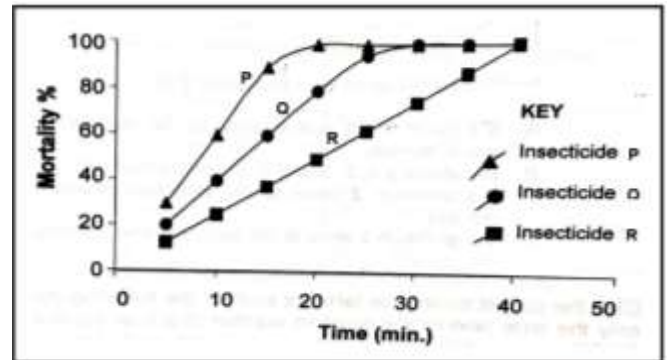
- A Condom
- B Oral contraceptive
- C Diaphragm
- D Vasectomy

85. Male moths recognise females of their species by sensing chemical signals called pheromones. This is an example of ...

- A habitat isolation
- B mechanical isolation
- C behavioural isolation
- D gamete isolation

**QUESTIONS 86 AND 87 ARE BASED ON THE INFORMATION AND GRAPH BELOW.**

The graph below shows the results from a resistance investigation in a single population. The same amount of each of three insecticides was used.



86. Which ONE of the insecticides has the slowest killing action, when the same quantity of each insecticide was used?

- A Insecticide P
- B Insecticide Q
- C Insecticide R
- D All the insecticides were equally slow



87. We can conclude from the data shown in the graph at 30 minutes that ...
- A both insecticides P and R have been 100% effective
- B both insecticides P and Q have been 100% effective
- C both insecticides Q and R have been 100% effective
- D all the insecticides have been 100% effective

88. Kwashiorkor and Marasmus are two deficiency diseases caused by malnutrition. The list below are major differences between the two diseases.

- (i) It is due to deficiency of protein and calories
- (ii) It is due to deficiency of protein
- (iii) Ribs are not very prominent
- (iv) Ribs become very prominent
- (v) Absence or mild-muscle wasting
- (vi) Severe muscle wasting
- (vii) Protuberant stomach
- (viii) No protuberant stomach

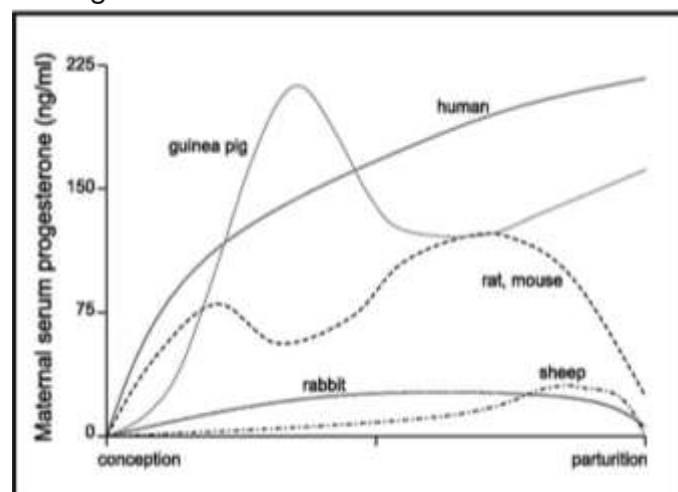
Which combination refers to children suffering from Kwashiorkor?

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

89. Which is the correct order of embryonic development of the following four stages?

- A blastula → morula → gastrula → organogenesis
- B gastrula → organogenesis → blastula → morula
- C morula → blastula → organogenesis → gastrula
- D morula → blastula → gastrula → organogenesis

90. The graph below shows maternal serum concentrations of progesterone through gestation.



In which of the animals are progesterone levels maintained at a high level throughout parturition?

- A Guinea pig and rat only
- B Sheep and rabbit only
- C Human and guinea pig only
- D Human and rat only

91. A horse has eaten 10 kg of biomass in the form of grass, and excreted 6.3 kg in the form of faeces, urine and gas. The increase in its body tissues is 0.4 kg. So how much biomass has been used up in respiration?

- A 16,7 kg
- B 6,7 kg
- C 3,3 kg
- D 9,6 kg

92. Working in the Amazon River, a biologist isolated DNA from two unknown organisms, P and Q. He discovered that the adenine content of P was 15% and the cytosine content of Q was 42%. This means that:

- A the amount of guanine in P is 15%
- B the amount of guanine and cytosine combined in P is 70%
- C the amount of adenine in Q is 42%
- D the amount of thymine in Q is 21%

93. Global warming occurs because ...
- A carbon dioxide and other greenhouse gases react chemically to produce excess heat
  - B Earth has too many greenhouses and other glassed buildings
  - C volcanic eruptions produce large quantities of sulphur and other greenhouse gases
  - D carbon dioxide and other greenhouse gases trap infrared radiation in the atmosphere

94. Which of the following characteristics contribute to power flight in birds?

- (i) a light-weight skeleton
- (ii) enlarged forelimb
- (iii) a keeled sternum
- (iv) scales on the legs and feet
- (v) homoeothermic

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

95. Plants in floodplains often get covered by water during floods. Some plants survive the floods because they can continue photosynthesis underwater. However, the plants' rates of photosynthesis are much lower underwater than those plants above water.

Which of the following helps to explain why the rates of photosynthesis are lower under water than above water?

- A There is too much oxygen in the water.
- B There is no carbon dioxide in the water.
- C The chloroplast do not function under water.
- D The available light is less intense underwater.

96. A girl is riding a bicycle at high speed around a sharp bend on the road. To prevent herself from falling, she follows the curve of the road. She also maintains her initial speed.

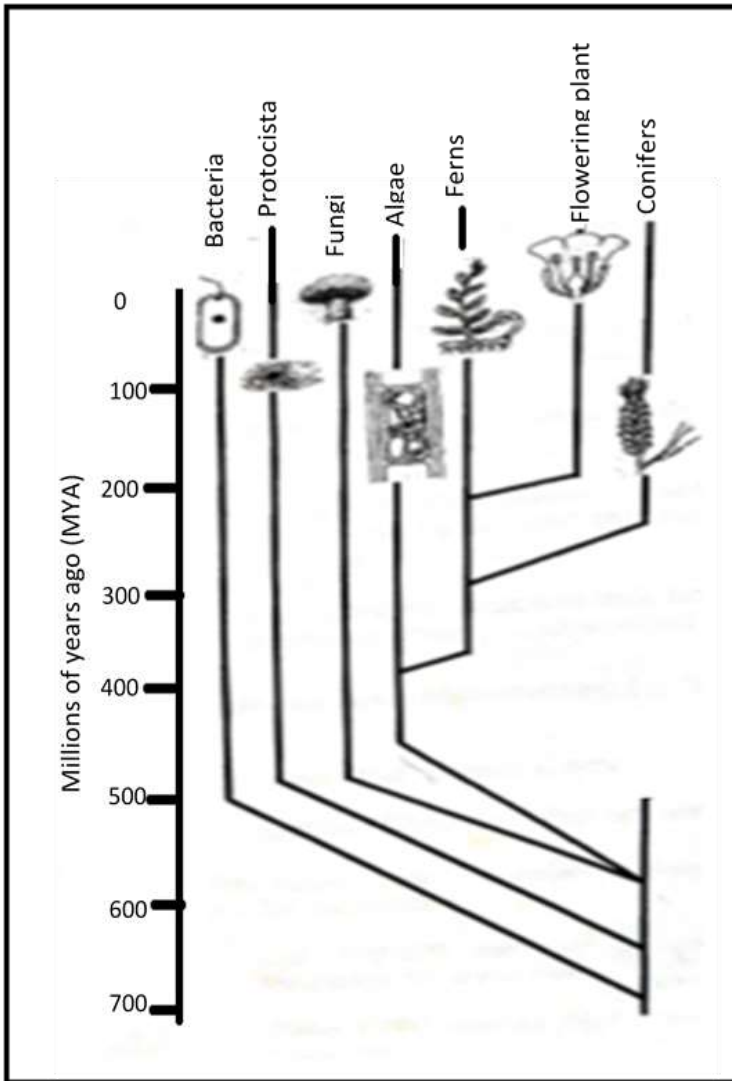
The following are possible changes that take place in the girl's body to turn the curve:

- (i) Cerebellum coordinates muscle for proper body movement
- (ii) Cristae detect body's position in response to movement
- (iii) Maculae determines the position of the body with respect to gravity
- (iv) Cristae detect body's position with respect to movement
- (v) Eye determine the movement of the path followed and send impulses to the cerebrum

Which combination will prevent the girl from falling off the bicycle?

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

**QUESTIONS 97 AND 98 REFER TO THE PHYLOGENETIC TREE BELOW.**



97. According to the phylogenetic tree when did the conifers evolve?

- A 100 mya
- B 200 mya
- C 300 mya
- D 400 mya

98. Which ONE of statement is CORRECT according to the phylogenetic tree?

- A The common ancestor of the algae and flowering plant is more recent than that of the ferns and flowering plant
- B The Protocista were the first organisms that lived on Earth
- C The common ancestor of the ferns and flowering plant is more recent than that of the algae and flowering plant
- D Bacteria and Fungi evolved at the same period as ferns.

99. The symptoms of a particular disease include:

Fever, dry cough, tiredness, shortness of breath, difficulty breathing, loss of smell or taste, pulmonary embolism, runny nose, sore throat

Which disease associates with these symptoms?

- A Bronchitis
- B Flu
- C COVID 19
- D Asthma

100. The following information are of a particular organism:

- Belongs to the order Gruiformes
- Tall with long legs, necks and bill
- Omnivore
- National bird of South Africa
- Generally brown; grey or white in colour
- Listed as vulnerable by the IUCN
- 

Which organism does this information relate to?

- A Cape Vulture
- B Sugar bird
- C Pelican
- D Blue Crane

The End