SOUTH AFRICAN AGENCY FOR SCIENCE AND TECHNOLOGY ADVANCEMENT

8th NATURAL SCIENCE OLYMPIAD EXAM

GRADES 7 – 9

8 May 2018

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

Natural Science Olympiad 2018

Grade 7 to 9

1. **Which animal can rotate its head about its neck 270 degrees?**

   A. A cat
   B. A snake
   C. An owl
   D. A dove

2. **Which mammal lays eggs?**

   A. Chicken
   B. Platypus
   C. Bat
   D. Human being

3. **Where are the only places that dogs have sweat glands?**

   A. Noses and ears
   B. Paws and eyes
   C. Noses and paw pads
   D. Ears and paws

4. **How many muscles does it take a dog to move its ear?**

   A. 18
   B. 10
   C. 25
   D. 6

5. **How many countries are there in Africa?**

   A. 54
   B. 60
   C. 45
   D. 72

6. **What letter does not appear in the periodic table of the elements?**

   A. Y
   B. J
   C. Z
   D. Q

7. **Kangaroo Rats can live longer (up to 5 years) than other mammals without …**

   A. Eating food
   B. Drinking water
   C. Opening their eyes
   D. Perspiring

8. **One special feature about hummingbirds is that …**

   A. They can see at night.
   B. They can fly backwards.
   C. They can stand on one foot for 3 hours.
   D. They can swim in water for a distance of 3 km.

9. **Approximately how many muscles does the human body have?**

   A. 640
   B. 3000
   C. 20000
   D. 400000

10. **Apart from the two colours, black and white, which is the third colour that new born babies can see?**

    A. Grey
    B. Yellow
    C. Green
    D. Red

11. **Which planet was first orbited by Galileo an unmanned American spacecraft?**

A. Venus
B. Mars
C. Jupiter
D. Earth

12. How many Earths could fit into the Sun?

A. 50
B. 1300 000
C. 10 000
D. 100 000

13. Arrange the following planets in order of increasing sizes:

A. Venus, Mars, Saturn and Earth
B. Mercury, Earth, Neptune, Saturn
C. Jupiter, Uranus, Mars and Earth
D. Saturn, Mercury, Earth and Venus

14. What is the other name for Sirius, the brightest star in the night sky that is one of the closest to Earth, and is easily spotted in winter and spring evenings?

A. The Winter Star
B. The Dwarf Star
C. The Hot Star
D. The Dog Star

15. Which of the following planets are the hottest and the coldest respectively?

A. Venus is the hottest planet and Neptune is the coldest planet.
B. Saturn is the hottest planet and Jupiter is the coldest planet.
C. Saturn is the hottest planet while Mars is the coldest planet.
D. Earth is the hottest planet while Uranus is the coldest planet.

16 What causes seasons here on planet Earth?

A. The elliptical orbit of the Moon
B. Periodic changes in the heat retention of the Earth's atmosphere
C. The tilt of the Earth's axis
D. The Earth's elliptical orbit brings it closer and farther from the Sun

17. If the Earth suddenly reversed its direction of spin, without changing its orbital direction around the Sun …

A. summer would come six months later.
B. the stars would move across the sky counter clockwise around Polaris.
C. the Sun would travel in reverse through the signs of the Zodiac.
D. the Sun would rise in the West and set in the East

18. Which planet in our Solar System is the lightest?

A. Saturn
B. Jupiter
C. Mercury
D. Earth

19. Which of the following stars is the furthest from the Sun?

A. Sirius
B. Alpha Centauri
C. Procyon
D. All the three are situated at the same distances away from the Sun.

20. Which of the following planets has 15 satellites?

A. Mercury
B. Jupiter
C. Neptune
D. Uranus

21. What colour are the hottest stars?

A. Blue
B. White
C. Red
D. Orange

22. Which of the following pairs of planets in our Solar System have no moons?

A. Mars and Venus
B. Venus and Earth
C. Mercury and Jupiter
D. Mercury and Venus

23. What is the name of Saturn's largest moon?

A. Titan
B. Ganimede
C. Io
D. Europa

24. There are currently five official dwarf planets in our Solar System. Apart from Ceres, Eris, Makemake and Haumea, which is the fifth?

A. Dysnomia
B. Charon
C. Pluto
D. Earth

25. The atmospheres of Jupiter, Saturn, Uranus and Neptune consist primarily of two gases. The two gases are …

A. Helium and Oxygen
B. Helium and Hydrogen
C. Carbon dioxide and Oxygen
D. Hydrogen and Oxygen

26. Which one of the following planets has the strongest winds in our Solar System?

A. Neptune
B. Earth
C. Mars
D. Venus

27. Who was the first person to orbit the Earth using the Mercury capsule called Friendship 7?

A. Mark Shuttleworth
B. Neil Armstrong
C. Christopher Columbus
D. John Glenn

28. When was the planet Uranus discovered?

A. 1817
B. 1781
C. 1994
D. 1632

29. How many people won seats on an hour-long sub-orbital trip in 2015, where Mandla Maseko was the world's first black African astronaut?

A. 15
B. 23
C. 10
D. 28

30. When was South Africa's second satellite, SumbandilaSat, launched?

A. September 2009
B. April 1994
C. June 2010
D. December 1990

31. How long did it take the Russian cosmonaut, Yuri Gagarin, to reach space in his orbital flight Vostok 1 spacecraft?

A. 3 hours
B. 108 minutes
C. 7 days
D. 24 hours

32. What sport did the Apollo astronaut, Alan Shepard, play on the moon on the 3rd of October 2010?

A. Golf
B. Soccer
C. Cricket
D. Rugby

33. What name is commonly used to represent the boundary area between the Earth's atmosphere and outer space?

A. The Tropic of Cancer
B. The Equator
C. The Edge of Space
D. The Edge of Boundary

34. Some objects are invisible in space yet astronomers know they exist. On what do they base their knowledge?

A. Some objects give off radio or X-rays that can be captured by radio telescopes and analysed.
B. They were once visible and people recorded it.

C. Astronomers have a “sixth” sense that helps them know things.
D. Telescopes can see things that people cannot.

35. What name is given to a small object made of ice, frozen gas and dust that orbits the Sun?

A. Comet
B. Meteorite
C. Asteroid
D. Valentina Tereshkova

36. When did the space probe Philae Lander, successfully land on Comet 67P?

A. 10 Dec 1966
B. 01 January 1966
C. 27 April 1994
D. 12 November 2014

37. What type of visible star is the coolest?

A. M - Star
B. O - Star
C. G - Star
D. A – Star

38. Which one of the following statements is correct regarding stars?

A. The birth places of stars are huge, hot clouds of gas and dust, known as nebulas.
B. When a star dies, it expands to become a red giant, then collapses to form a very dense white dwarf, which later cools down and becomes invisible.
C. The nearest and brightest star to planet Earth is the Southern Cross.
D. The coolest, slowest burning stars are red dwarfs.

39. What is the highest wind speed ever recorded on planet Earth?

A. 100 km/h
B. 600 km/h
C. 260 km/h
D. 408 km/h

40. The largest amount of dissolved oxygen is present in …

A. distilled water.
B. hot water.
C. cool water.
D. diluted water.

41. Which other animal shares an unusual and intimate underwater relationship with hermit crabs?

A. Anemone
B. Whelk
C. Lobster
D. Snail

42. Which is the largest individual flower that is very rare and requires special conditions for it to blossom?

A. Daisy
B. Rafflesia
C. Violet
D. Rose

43. What is the name of the whale that has a long protruding tusk?

A. Narwhal
B. Sperm whale
C. Killer whale
D. Blue whale

44. Which of the following mammals gives birth to undeveloped young that are kept in pouches.

A. Monkeys
B. Bats
C. Marsupials
D. Human beings

45. What is osteoporosis?

A. It is loss of calcium from bones, resulting in porous weak bones.
B. It is an excess of salt in a human body.
C. It is an excess of oxygen in a human body.
D. It is shortage of water in the head of a human body.

46. What is a shark's skeleton made of?

A. Bones
B. Iron
C. Cartilage
D. Flesh

47. Unlike rodents, how many incisor teeth does a rabbit have?

A. Six
B. Four
C. Eight
D. Two

48. Occasionally, a bad cold will cause a decrease in a person's hearing ability. What is the name of the tube that becomes blocked to cause this problem?

A. Ventilation tube
B. Uterine tube
C. Capillary tube
D. Eustachian tube

49. Which of the following can be considered as the world's largest invertebrate?

A. Elephant
B. Whale
C. Colossal Squid
D. Dinosaurs

50. How much urine does a healthy human adult produces each day?

A. 50 ml
B. 150 ml
C. 1500 ml
D. 5000 ml

51. The rate at which water evaporates from the surfaces of dam, which is exposed to air, is NOT dependent on the:

A. Velocity of the wind blowing over the dam
B. Humidity
C. Temperature
D. Depth of the dam

52. A Venus Fly Trap is one of the only plants that can eat animals. When a fly, or other small animal lands on its mouth, the Venus Fly Trap snaps shut and eat it.

Venus Fly Trap

Venus Fly Traps can eat…

A. flies, beetles, snakes, caterpillars, and frogs.
B. flies, beetles, butterflies, tortoise, and birds.
C. lizards, beetles, butterflies, caterpillars, and frogs.
D. flies, beetles, butterflies, caterpillars, and frogs.

53. Which animal can store water in its bladder for a long period of time, instead of excreting it as urine, and bring it back to its mouth and drink it when it is thirsty?

A. Water tortoise
B. Water-holding frog
C. Camel
D. Desert tortoise

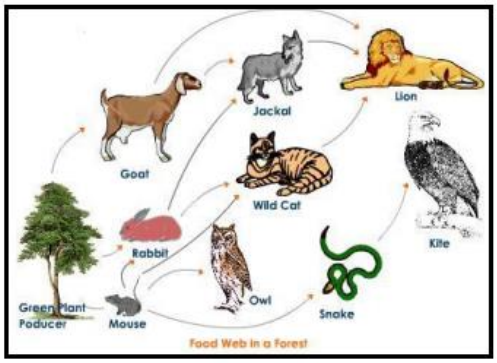
54. Which one of the following statements is NOT true about a stroke?

A. It occurs when a blood vessel carrying oxygen and nutrients to the brain is either blocked by a clot or bursts.
B. It affects the arteries leading to and within the brain.
C. It usually affects one side of the brain but will result in affecting the other side of the body.
D. All strokes are the same.

55. What is the lifespan of a mayfly, the shortest living animal on earth?

A. One week
B. 24 hours
C. One month
D. 12 hours

56. Consider the following food web. A disease broke out that killed a large number of wild cats. Which one of the responses A, B, C or D shows what happened to the populations of organisms thereafter?



	Increased	Decreased
A.	Rabbits	Mice
B.	Mice	Lions
C.	Snakes	Mice
D.	Mice	Kites

57. *Canis lupus familiaris* is the scientific classification of …

A. wolves.
B. jackals.
C. fox.
D. domestic dogs.

58. Who was the first person to speculate that chromosomes are the carriers of inheritance?

A. Wilhelm Roux
B. William Bateson
C. Wilhelm Johannsen
D. David Moyes

59. Which animal has teeth in its stomach?

A. Lobster
B. Shark
C. Whale
D. Crocodile

60. Which type of reaction produces the energy in the Sun?

A. Nuclear fission
B. Thermal convection
C. Chemical reaction of gases
D. Nuclear fusion

61. Solar flares from the Sun produce high energy particles and radiation that are dangerous to living organisms. However, at the surface of the Earth we are well protected from the effects of solar flares and other solar activity by the Earth's magnetic field and atmosphere. Which layer of the Sun is responsible for producing these solar flares?

A. Radiative zone
B. Photosphere
C. Chromosphere
D. Convective zone

62. The following form of electromagnetic radiation is used in butcheries to kill bacteria.

A. Indigo light
B. Blue light
C. Violet light
D. Ultraviolet light

63. Which of the following is considered to be a renewable resource?

A. Coal fired power plant
B. Hydroelectric dam
C. Combustion turbine facility
D. Nuclear fission power plant

64. When did Sanctorius develop the first thermometer used in clinical work?

A. 1612
B. 1902
C. 1736
D. 1806

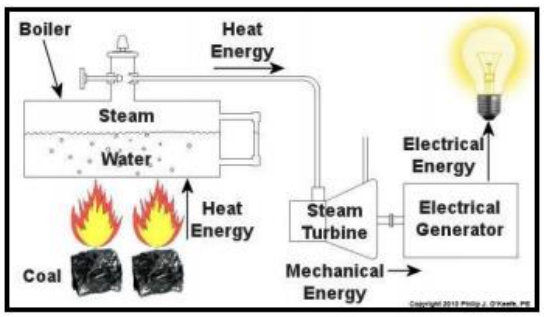
65. Liquid fuels can be used to generate electricity in a variety of ways. Which of the following technologies converts liquid fuel directly to electricity without a combustion step?

A. Turbine
B. Battery
C. Fuel cell
D. Stirling engine

66. A type of plastic that is biodegradable has been in the news lately. What is the ingredient that makes it biodegradable?

A. Vegetable oil
B. Corn-starch
C. Petroleum
D. Leather

67. Consider all energy conversions taking place in the picture:



Which of the following combinations of energy conversions, in the correct order, is taking place in the picture?

A. Thermal → Chemical → Kinetic → Light → Kinetic
B. Chemical → Thermal → Kinetic → Electrical →Light
C. Thermal → Kinetic → Potential → Electrical → Light
D. Chemical → Thermal → Electrical → Light → Heat

68. When water is boiling in a pot, the water seems to follow a vertical circular motion. The reason water boils causing this circular motion is due to …

A. radiation
B. conduction
C. convection
D. none of the above

69. Consider the light bulbs shown below and choose the correct statement. Light bulb 1 is a normal incandescent bulb, while light bulb 2 is a fluorescent bulb.

Light bulb 1

Light bulb 2

A. Light bulb 1 is more expensive and gives dimmer light compared to light bulb 2.
B. Light bulb 1 is more expensive and uses more electricity than light bulb 2.
C. Light bulb 1 is less expensive and it is more energy efficient.
D. Light bulb 1 is less expensive and it is not energy efficient.

70. Consider two resistors R_1 and R_2 where both R_1 and R_2 are equal to one (1) ohm. The sum of these resistors connected in parallel is …

A. always greater than 1 ohm.
B. always less than 1 ohm.
C. always equal to 1 ohm.
D. 2 ohm.

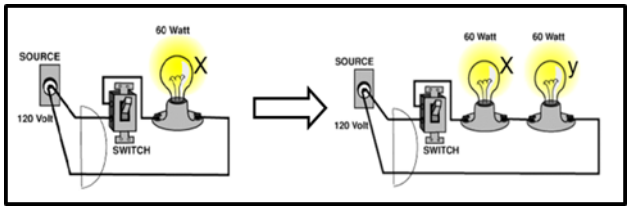
71. Besides iron, which other three elements make up the alloy 'alnico', whose name stems from an acronym derived from the names of the different elements? This alloy is used for making magnets.

A. Copper, nickel and aluminium
B. Nickel, carbon and aluminium
C. Aluminium, nickel and cobalt
D. Cobalt, aluminium and nitrogen

72. Three resistors, each with a resistance of 2 ohm, generate an effective resistance of 3 ohm when connected in a circuit. Predict how the three resistors should be connected relative to each other to achieve this.

A. A series combination of two resistors and one in parallel.
B. A parallel combination of two resistors and one in series.
C. All three resistors connected in parallel.
D. All three resistors connected in series.

73. In the figure below, what will happen to the current in the circuit, the voltage across bulb X and the total resistance of the circuit when another identical bulb (y) is connected in series with bulb X?



A. Current is doubled, voltage across bulb X doubles and total resistance of the circuit doubles.
B. Current is halved, voltages across bulb X is halved and total resistance of the circuit is halved.
C. Current is halved, voltage across bulb X is halved and total resistance of the circuit doubles.
D. Current is halved, voltages across bulb X doubles and total resistance of the circuit remains the same.

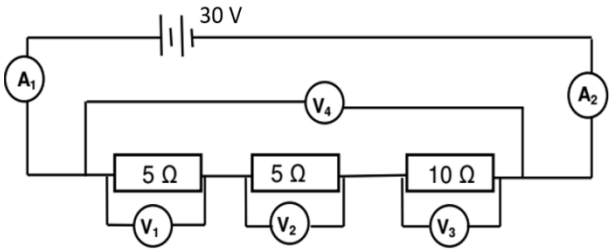
74. What happens to the total current in the circuit when one of three resistors is removed from a circuit and the circuit is reconnected? You can assume that all resistors were initially connected in series.

A. The total current remains the same.
B. The total current increases.
C. The total current decreases.
D. The current will stop flowing.

75. The fluorescent tubes and neon sign bulbs glow because of ….

A. the presence of charged particles.
B. high density of gases.
C. high temperature.
D. high applied voltage.

76. Consider the circuit diagram and answer the question that follows:



The reading on V_1 will be...

A. 5V.
B. 10 V.
C. 7.5 V.
D. 20 V.

77. Steel is an alloy composed of a number of elements. The two essential elements are iron and …

A. aluminium.
B. carbon.
C. nickel.
D. silicon.

78. Which two gases are used to disinfect water in sewage treatment facilities?

A. Helium and nitrogen
B. Nitrogen and chlorine
C. Oxygen and hydrogen

D. Ozone and chlorine

79. Which of the following materials is used along with iron ore and limestone to produce iron in a modern blast furnace?

A. Coke
B. Cementite
C. Coal
D. Bauxite

80. A large volume of compressed natural gas (CNG) is made available for use in small cylinders. What property of natural gas is responsible for this fact?

A. High compressibility of CNG
B. High inflammability of CNG
C. The low density of CNG
D. The relative easy availability of CNG

81. Which property of a substance indicates whether the substance is a liquid or a solid at room temperature?

A. Solubility
B. Electrical conductivity
C. Flexibility
D. Melting point

82. What is formed when there is a chemical reaction between an acid and a metal oxide?

A. A salt and water
B. Hydrogen gas and a salt
C. An acid and a base
D. An acid and a metal

83. What is formed when there is a chemical reaction between an acid and a metal?

A. A salt and water
B. Hydrogen gas and a salt
C. An acid and a base
D. An acid and a metal

84. What is neutralisation?

A. It is a chemical reaction between an acid and a metal.
B. It is a chemical reaction between an acid and a metal oxide.
C. It is a chemical reaction between an acid and a base.
D. It is a chemical reaction between a base and a salt.

85. Under which conditions would a sugar cube dissolve most quickly when placed in a litre of water at room temperature?

A. A whole sugar cube is added and the water is stirred.
B. A whole sugar cube is added and the water is not stirred.
C. A crushed sugar cube is added and the water is stirred.
D. A crushed sugar cube is added and the water is not stirred.

86. A certain element has the following properties: ***Good conductor of electricity, ductile, malleable, sonorous.***

Which of the following represents the symbol of the element that best suits the description given above?

A. Br
B. Ne
C. H
D. Fe

87. Which elements were formed in larger proportions during the creation of the Universe?

A. Hydrogen and neon
B. Hydrogen and helium
C. All the elements now present
D. Only elements heavier than iron

88. The hardest substance available on Earth is made up of _____ atoms.

A. gold
B. iron
C. carbon
D. diamond

89. Nitrous oxide is also known as …

A. a noble gas
B. a laughing gas
C. an inert gas
D. a perfect gas

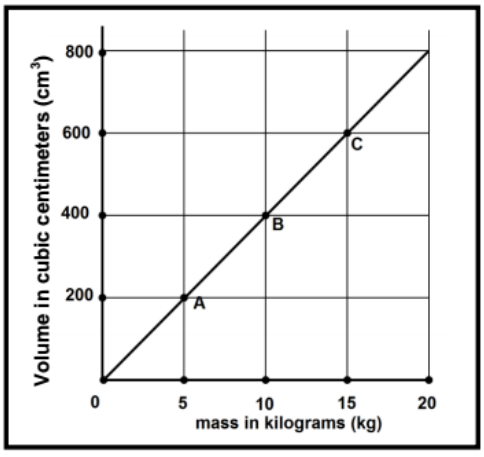
90. Which of the following metals forms an amalgam with other metals?

A. Tin
B. Mercury
C. Lead
D. Zinc

91. Which element had its symbol derived from the Latin word that means "liquid silver"?

A. Mercury
B. Gold
C. Lead
D. Oxygen

92. The graph below shows the relationship between mass and volume for three samples, A, B, and C, of a given material. What is the density of this material?



A. 1.0 g/cm³
B. 5.0 g/cm³
C. 40.0 g/cm³
D. 25.0 g/cm³

93. A white solid substance, which is yellow when heated but changes colour back to white when cooled down

A. ZnO
B. Ag_2O
C. CaO
D. PbO

94. Which of the following is <u>NOT</u> a characteristic of non-metals.

A. Low melting and boiling points
B. Brittle
C. Poor conductors
D. Ductile

95. What is the name of the gas that is used in television tubes?

A. Chlorine
B. Hydrogen
C. Neon
D. Nitrogen

96. Gases do not have …

A. high compressibility.
B. high fluidity.
C. high kinetic energy.
D. high density.

97. The size of a nanostructured material is …

A. 1 nm - 100 nm.
B. 100 nm and 200 nm.
C. 1 nm and 10 nm.
D. 10 nm and 100 nm.

98. How many nanometres are there in 2.3×10^{-6} m?

A. 230 nanometres
B. 2.3 nanometres
C. 0.0023 nanometres
D. 2.3×10^3 nanometres

99. In which year did the Japanese scientist Norio TANIGUCHI first use the term "nanotechnology"?

A. 1974
B. 1959
C. 1994
D. 1976

100. One application of nanotechnology in medicine is ….

A. removing an intestine from a patient's stomach.
B. feeding a patient with a small amount of food.
C. adding pins to a human bone.
D. early diagnosis of infectious diseases.