



## 6<sup>th</sup> NATURAL SCIENCE OLYMPIAD

GRADE 7 TO 9

12 MAY 2016

09:00 - 12:00

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### 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 most 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 – 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. The student number allocated to you can be obtained from your teacher and consists of eight digits e.g. 08149701

Do not fold the answer sheets.

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**Three hours are allowed to answer the questions**

# Natural Science Olympiad 2016

## Grade 7 to 9

### SECTION A: GENERAL KNOWLEDGE

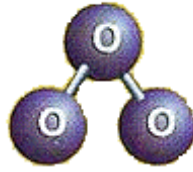
- When water freezes ... (complete the sentence).
  - its temperature increases and volume decreases.
  - its temperature decreases and volume decreases.
  - its temperature decreases and volume increases.
  - its temperature decreases and volume remains unchanged.
- Which of the following is the fastest animal?
  - Cheetah
  - Falcon
  - Impala
  - Elephant
- Which of the following is the largest organ in the human body?
  - Brain
  - Stomach
  - Skin
  - Lungs
- Alcohol abuse may lead to one of the following:
  - Foetal Alcohol Syndrome
  - An increased risk of strokes and heart attacks
  - Osteoporosis
  - Anaemia
- Which one of the following gases leads to the discolouration of brass?
  - Oxygen
  - Nitrogen
  - Carbon dioxide
  - Hydrogen
- SKA stands for ...
  - Scientific Knowledge Applications
  - Sound Knowledge Arbiters

- Scientific Knights Army
- Square Kilometre Array

- Which of the following is used in pencils?
    - Graphite
    - Silicon
    - Charcoal
    - Phosphorous
  - The common name for washing soda.
    - Sodium carbonate
    - Calcium carbonate
    - Sodium bicarbonate
    - Calcium bicarbonate
  - Which of the following gases is known as a greenhouse gas?
    - Nitrous oxide
    - Methane
    - Carbon dioxide
    - Argon
  - The hardest substance available on earth.
    - Gold
    - Iron
    - Diamond
    - Platinum
- ### SECTION B: SPACE SCIENCE AND ASTRONOMY
- The Moon revolves around the Earth at an average orbital speed of about \_\_\_\_\_.
    - 360km/h
    - 1km/h
    - 28km/h
    - 36km/h
  - Which of these statements is correct?
    - Spring tides occur when the Sun and Moon are at 90 degrees to each other.
    - Neap tides occur when the Sun and Moon are in line with each other.
    - Neap tides occur when the Sun and Moon are at 90 degrees to each other.
    - Spring tides occur when the Earth and Moon

are in line with each other.

13. Why is ozone important to life on Earth?



- A It is required for respiration.
- B It removes chlorofluorocarbons from our atmosphere.
- C It kills harmful bacteria and fungi.
- D It absorbs harmful ultraviolet rays from the Sun.

14. The sun is mainly made of \_\_\_\_\_.

hot rocks, oxygen gas and hydrogen  
hydrogen gas and helium gas  
oxygen gas and helium gas  
molten rock and methane gas

15. The acceleration due to gravity on Earth is  $9,8\text{m/s}^2$  while on planet Mars it is  $3,8\text{m/s}^2$ . What will the mass of a learner be on Mars if his mass on Earth is 50kg?

- A 50kg
- B 190kg
- C 37.24kg
- D 490kg

16. Which of the following statements about the temperatures of the planets is correct?

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

17. How many planets are there in our solar system?

- A 8
- B 9
- C 10
- D 11

18. What do we call "...a huge and rotating collection of gas and dust with billions of stars, planets and other celestial objects"?

- A Galaxy
- B Nebula
- C Solar system
- D Universe

19. The distance to the next closest star, Proxima Centauri is  $4,01 \times 10^{13}$  km from Earth. If 1 Light Year is  $9,46 \times 10^{12}$  km, what is the distance to Proxima Centauri in Light Years?

- A 4.24 Light Years
- B 30.64 Light Years
- C 49.56 Light Years
- D 13.47 Light Years

20. What type of reaction produces the energy in a sun?

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

21. What two components describe a red giant star compared to other types of stars?

- A Big and hot
- B Small and hot
- C Big and cold
- D Small and cold

22. What type of star is our Sun?

- A Our Sun is not a star
- B Red giant
- C White dwarf
- D Main sequence star

23. What forms when the core of the star is "swallowed" by its own gravity?

- A Black hole
- B Red giant
- C Nebula
- D Neutron star

24. What do we call the rocks that enter the Earth's

atmosphere and blaze a trail all the way to the ground and do not burn up completely?

- A Meteorites
- B Meteors
- C Asteroids
- D None of these

25. The time when we experience the shortest day of the year on Earth is \_\_\_\_\_.

- A summer solstice
- B winter solstice
- C summer equinox
- D winter equinox

26. On which planet is the biggest volcano in the solar system?

- A Saturn
- B Jupiter
- C Venus
- D Mars

27. Which colours are the hottest and the coldest stars respectively?

- A Blue and red
- B Red and blue
- C Yellow and orange
- D Red and yellow

28. An object that revolves around another object in outer space is a \_\_\_\_\_.

- A star
- B moon
- C galaxy
- D satellite

29. \_\_\_\_\_ is a form of visible electromagnetic radiation.

- A Light
- B Ray
- C Cosmo
- D Galaxy

30. The bending of light as it travels from one medium to another is called \_\_\_\_\_.

- A reflection

- B refraction
- C inspection
- D absorption

31. Which of the following electromagnetic radiation forms has the highest frequency?

- A Gamma rays
- B X-ray
- C Ultraviolet
- D Infrared

32. Which of the following electromagnetic radiation forms has the highest wavelength?

- A Gamma rays
- B X-ray
- C Ultraviolet
- D Infrared

33. How many colours make up the spectrum of white light?

- A 4
- B 5
- C 6
- D 7

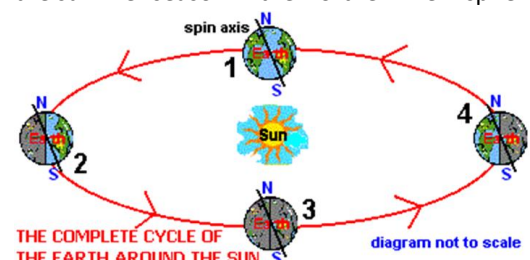
34. The following form of electromagnetic radiation is used in butcheries to kill bacteria.

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

35. Which planet is nearest to the Sun?

- A Neptune
- B Mercury
- C Mars
- D Uranus

36. Which position in the cycle corresponds to the summer season in the Northern Hemisphere?



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

37. "Dirty snowballs" is another name for ... (complete the sentence).

- A comets
- B meteorite
- C stars
- D planets

38. Which one of the following causes change in the seasons on Earth?

- A Earth's rotation
- B The Sun's rotation
- C Earth's revolution
- D The Sun's revolution

39. Which of the following results in day and night on Earth?

- A Earth's rotation
- B The Sun's rotation
- C Earth's revolution
- D The Sun's revolution

40. Which planet lies third on the outward spiral from the Sun?

- A Jupiter
- B Neptune
- C Pluto
- D Earth

### SECTION C: NANOTECHNOLOGY

41. The prefix "nano" comes from a ...

- A Greek word meaning dwarf
- B French word meaning billion
- C Latin word meaning small
- D Spanish word meaning particle

42. The size of a nanostructure is between... (complete the sentence)

- A 1nm and 10nm
- B 100nm and 200nm

- C 1nm and 100nm
- D 10nm and 100nm

43. Richard Feynman is often credited with predicting the potential of nanotechnology. What was the title of his famous speech given on December 29, 1959?

- A "There is tiny room at the bottom."
- B "There is plenty of room at the bottom."
- C "There is no room at the bottom."
- D "There is plenty of room at the top."

44. The most important property of nanomaterials is ... (complete the sentence)

- A force
- B friction
- C pressure
- D None

45. He is known as the father of nanotechnology.

- A Albert Einstein
- B Sir Isaac Newton
- C David Boyle
- D Richard Feynman

46. Which of the following is a nanoparticle?

- A Blue haze on a mountain when viewed from a distance
- B Rain drops
- C Dust particles
- D None of the above

47. Which one of the following does not use nanotechnology?

- A Food packaging
- B Cosmetics
- C Textile
- D None of the above

48. The diameter of oxygen atom is 0.14 nm. How much space in nanometres is needed to accommodate 200 oxygen atoms lined up in a row?

- A 14 nm
- B 20 nm

- C 28 nm
- D 0.28 nm

49. Optical tweezers ... (complete the sentence)

- A are used to remove facial hair with miniaturized laser beams.
- B use light to manipulate particles as small as a single atom.
- C are a nanotechnology tool for stamp collectors.
- D don't exist.

50. What is a buckyball?

- A A carbon molecule (C60)
- B Nickname for Mercedes Benz's futuristic concept car (C111)
- C Plastic explosive nanoparticle (C4)
- D Concrete nanoparticles with a compressive strength of 20 nanonewtons (C20)

**SECTION C: GENERAL CONTENT KNOWLEDGE**

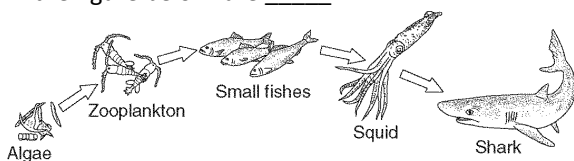
51. Based on the cycle of photosynthesis and cellular respiration, one can say that the ultimate original source of energy for all living things on Earth is ... (complete the sentence)

- A glucose.
- B water.
- C the Sun.
- D carbon dioxide.

52. Which of these is a by-product of the process of photosynthesis?

- A Water and carbon dioxide
- B Oxygen and sugar (glucose)
- C Water and oxygen
- D Oxygen

53. The algae at the beginning of the food chain shown in the figure below are \_\_\_\_\_.



- A consumers
- B decomposers
- C producers

- D heterotrophs

54. The incomplete table below shows how organisms are classified.

Kingdom
Z
Class
Y
Family
X
Species

What do the letters X, Y and Z represent?

	<b>X</b>	<b>Y</b>	<b>Z</b>
A	Order	Genus	Phylum
B	Organism	Order	Phylum
C	Genus	Order	Phylum
D	Phylum	Order	Genus

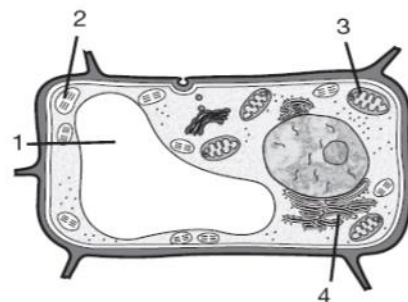
55. The broadest level of classification in organisms is called ... (complete).

- A Kingdom
- B Phylum
- C Class
- D Order

56. The process by which the features of species change over a period of time is called \_\_\_\_\_.

- A natural selection
- B classification
- C Evolution
- D growing up

Use the diagram below to answer questions 57 to 60.



57. Which type of cell shown in the diagram above?

- A Animal cell
- B Protozoan cell

- C Bacterial cell
- D Plant cell

58. Names of the parts numbered 1 and 2 respectively.

- A Mitochondrion and chloroplast
- B Cytoplasm and mitochondrion
- C Large central vacuole and chloroplast
- D Cytoplasm and chloroplast

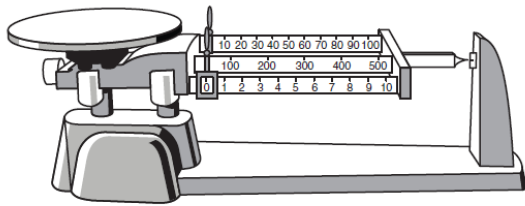
59. Which number on the cell indicates a part that stores water, salts and soluble pigments?

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

60. Which of the following symbiotic relationships is considered parasitic?

- A Ticks feeding on a dog
- B Bees transporting pollen from one flower to another
- C Pilot fish swimming under sharks
- D Birds eating the insects from the back of a hippopotamus

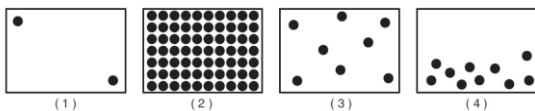
61. The diagram below shows a triple-beam balance.



What is the maximum mass, in grams, that could be measured by this balance?

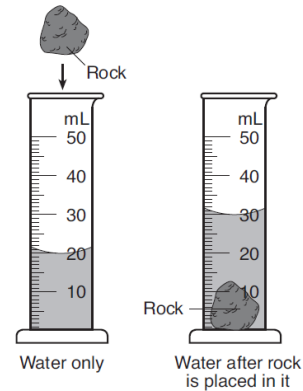
- A 110
- B 610
- C 500
- D 1510

62. Which diagram best represents molecules of matter in the solid phase?



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

63. The diagram below shows a rock being placed in a graduated cylinder containing water.



What is the volume of the rock?

- A 20 ml
- B 30 ml
- C 10 ml
- D 15 ml

64. During which phase change is heat energy absorbed by a substance?

- A Liquid to gas
- B Liquid to solid
- C Gas to solid
- D Gas to liquid

65. Which one of the following methods is used to separate the colours in food dyes?

- A Sieving
- B Decanting
- C Evaporation
- D Chromatography

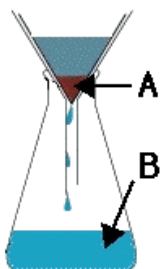
66. Liquids that do NOT mix are said to be ... (complete the sentence)

- A soluble
- B insoluble
- C immiscible
- D miscible

67. Liquids that do not mix may be separated by using ... (complete the sentence)

- A a filter funnel
- B an evaporating dish
- C a separating funnel
- D Liebig condenser

68. The diagram below shows the apparatus for separating soil and water.



What are the parts labeled A and B called respectively?

- A A = residue, B = distillate
- B A = distillate, B = filtrate
- C A = filtrate, B = residue
- D A = residue, B = filtrate

69. Which one of the following is not a mixture?

- A Steel
- B Sugar and tea
- C Air
- D Water

70. Which of the following chemical reactions will produce hydrogen gas?

- A Acid + metal
- B Acid + metal carbonate
- C Acid + base
- D Acid + metal hydroxide

71. Ammonia is found in many household products, such as window cleaners. It turns red litmus blue. What is its nature?

- A Basic
- B Acidic
- C Pure liquid
- D Neutral

72. The products formed when an acid reacts with a

base.

- A Oxygen and hydrogen
- B Oxygen and salt
- C Hydrogen and salt
- D Water and salt

73. The name given to the reaction between acids and bases.

- A Oxidation
- B Neutralisation
- C Reduction
- D Hydrolysis

74. The horizontal arrangement of elements in the periodic table is called ... (complete the sentence).

- A a period
- B a collection
- C an order
- D a group

75. Nitrogen is element number 7 in group 5. How many electrons does an atom of nitrogen have in its neutral state?

- A 5
- B 7
- C 12
- D 2

76. Beryllium has the same number of valence electrons as ... (complete the sentence)

- A hydrogen
- B magnesium
- C phosphorus
- D oxygen

77. Which of the following elements is a noble gas?

- A Neon
- B Hydrogen
- C Nitrogen
- D Oxygen

78. Which of the following is a correct, balanced chemical equation for the reaction between magnesium and oxygen?



- A  $\text{Mg} + \text{O} \rightarrow \text{MgO}$
- B  $\text{Mg} + \text{O}_2 \rightarrow \text{MgO}_2$
- C  $2 \text{Mg} + \text{O}_2 \rightarrow 2 \text{MgO}$
- D  $2 \text{Mg} + 2\text{O}_2 \rightarrow 2 \text{MgO}$

79. Most halogens form compounds by ... (complete the sentence)

- A gaining an electron to form a negative ion
- B losing an electron to form a positive ion
- C losing protons
- D gaining protons

80. A positively charged object has ... (complete the sentence).

- A gained protons
- B gained electrons
- C lost protons
- D lost electrons

81. Which of the following is a good insulator?

- A Silver
- B Aluminium
- C Copper
- D Glass

82. Electric potential is also known as ... (complete the sentence).

- A Watts
- B amperes
- C voltage
- D protons

83. An ammeter is used to measure ... (complete)

- A electric current
- B power
- C resistance
- D voltage

84. Which of the following is the SI unit for power?

- A Joule
- B Watt
- C Ampere
- D Volt

85. Which of the following is not a property of metals?

- A Ductility
- B Malleability
- C Good electrical conductivity
- D Dull appearance

86. A pure substance is a ... (complete the sentence)

- A solution
- B single compound that has definite chemical properties
- C substance that cannot be broken down
- D combination of two substances that are not chemically combined

87. Which of the following is not a physical characteristic that is used to identify an element?

- A Melting point
- B Boiling point
- C Density
- D Mass

88. Compounds can only be broken down by ... (complete the sentence).

- A chemical means
- B physical means
- C filtering
- D sifting the compound through a strainer

89. What is a molecule?

- A The smallest particle of an atom
- B A group of atoms that are chemically joined together
- C A subatomic particle with a negative charge
- D A charged particle found in the nucleus of an atom

90. An atom contains ... (complete the sentence)

- A only negative charges
- B only positive charges
- C both negative and positive charges
- D no charges

91. Which of the following particles are nucleons?

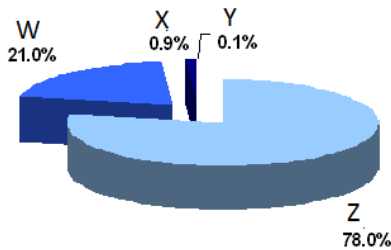
- A Electrons and protons
- B Electrons and neutrons
- C Electrons, protons and neutrons

D Protons and neutrons

92. Atoms of the same element with the same number of protons but different number of neutrons are called.....

- A molecules
- B compounds
- C isotopes
- D isomers

93. The pie-chart below shows the four gases found in the atmosphere represented by W, X, Y and Z. Identify the gases.

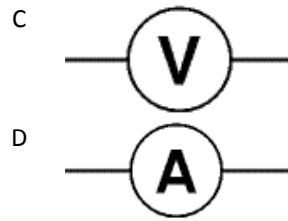
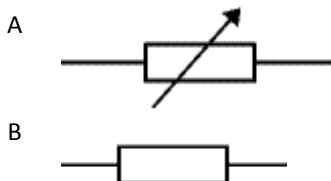


- A W - Carbon dioxide, X - Hydrogen, Y - Nitrogen, Z - Oxygen
- B W - Oxygen, X - Carbon dioxide, Y - Argon, Z - Nitrogen
- C W - Nitrogen, X - Hydrogen, Y - Carbon dioxide, Z - Oxygen
- D W - Oxygen, X - Argon, Y - Carbon dioxide, Z - Nitrogen

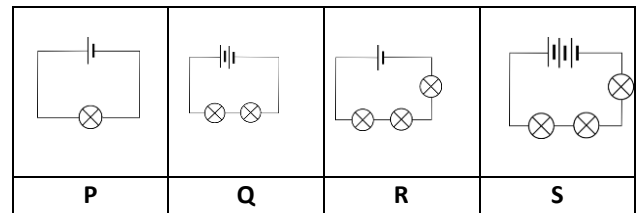
94. Calcium, magnesium, iron and sodium are important minerals which should be included in a healthy diet. Which of the following sets of food will provide these important minerals?

- A Milk, salted meat, spinach
- B Banana, cake and coffee
- C Milk, coffee and bread
- D Fish, chips and cool drink

95. The symbol for a variable resistor.



96. Consider the electric circuits below. The conductors, cells and bulbs are identical. Which statement regarding the circuits below is correct?

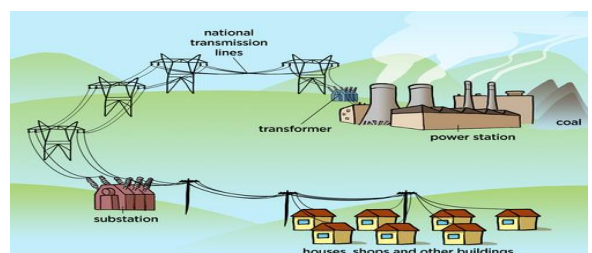


- A The electric current in circuit P is less than in circuit Q but more than in circuit R.
- B The electric current in circuit P is more than in circuit R but less than in circuit S.
- C The electric current in circuit P is the same as in circuit S but less than in circuit R.
- D The electric current in circuit P is the same as in circuit Q but more than in circuit R.

97. What type of force exists between like charges?

- A Torsional force
- B Attraction
- C Repulsion
- D Friction

98. The figure below shows the electrical generation, transmission and distribution parts of the national grid. Which statement regarding the transmission line is correct?

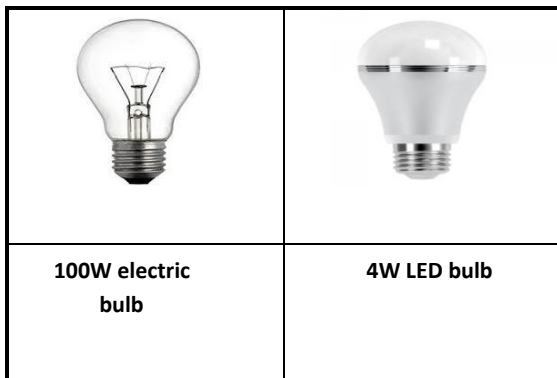


- A The national transmission lines carry very high voltage and very high electric current.
- B The national transmission lines carry very high voltage and low electric current.
- C The national transmission lines carry very

low voltage and very high electric current.

- D The national transmission lines carry low voltage and low electric current.

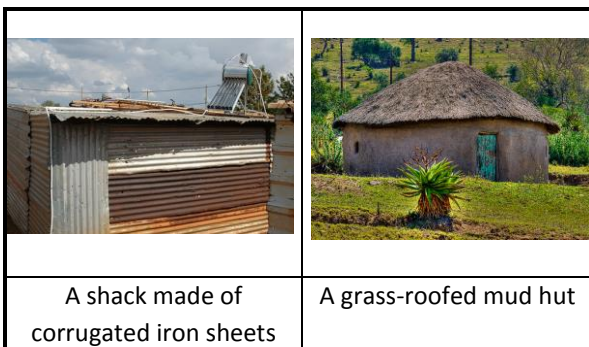
99. A 100W incandescent electric bulb produces light of the same brightness as the 4W LED light shown below. Jowi uses the 100W bulb in his room while Maria uses the 4W LED bulb in her room. If the cost of 1KWh of electricity is 72 cents and both Jowi and Maria operated their bulbs for 100 hours in one month. Which of these calculations is correct regarding the cost of electricity used?



Which of these calculations is correct regarding the cost of electricity used?

- A The monthly cost of electricity used by Jowi is R2.88 more than the cost of electricity used by Maria's bulb.
- B The monthly cost of electricity used by Jowi is R28,00 and the cost of electricity used by Maria's bulb is R2.88.
- C The monthly cost of electricity used by Jowi is R7.20 more than the cost of electricity used by Maria's bulb.
- D The monthly cost of electricity used by Jowi is R4.32 more than the cost of electricity used by Maria's bulb.

100. Consider the two pictures below and answer the question that follows:



Which one of the following statements about the two dwellings is correct?

- A The shack will feel cooler inside than the hut on a hot summer's day because iron is a better conductor of heat than mud.
- B The mud hut will feel warmer on a cold winter's day than the shack because mud and grass are good heat insulators.
- C On a hot summer's day, the shack will be warmer inside if it is painted white and will be cooler inside if it is painted black.
- D On a hot summer's day the temperature inside both dwellings will be the same because both the shack and the hut do not have proper windows.

**The End**