UNIFIED COUNCIL
An ISO 9001:2008 Certified Organisation
nstse
Test • Assess • Achieve

NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION - 2013

Mathematics

1. (B) $\frac{d^2}{2} = 16900$

$d^2 = 16900 \times 2$

$d = 130 \times \sqrt{2}$ m

2. (C) $\sqrt{\left(\frac{9}{16} \times \frac{5}{2}\right) \times \frac{8}{9} \times \frac{16}{5}} = \sqrt{4} = 2$

3. (B) $9^n = \left(3^2\right)^n = 3^{2n}$

$9^n + 9^n + 9^n = 3 \times 3^{2n} = 3^{2n+1}$

$\Rightarrow 3^{2n+1} = 3^{2013}$

$\Rightarrow 2n + 1 = 2013$

$\Rightarrow 2n = 2012$

$\Rightarrow n = 1006$

4. (A) Try x = 100 or 121 or 144

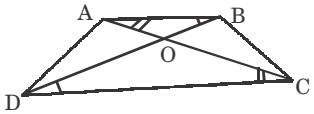
i.e., 10^2 or 11^2 or 12^2.

5. (C) $\frac{(67.542)^2 - (32.458)^2}{75.458 - 40.374}$

$= \frac{100 \times 35.084}{35.084} = 100$

6. (A) In ΔOAB and ΔOCD

$\angle AOB = \angle COD$ (vertically opp $\angle$s)



$\angle ABD = \angle BDC$ and

$\angle BAC = \angle ACD$ (Alt. $\angle$s)

$\therefore \Delta OAB \cong \Delta OCD$

$\Rightarrow \frac{OA}{OC} = \frac{OB}{OD} = \frac{AB}{CD}$

7. (C) Difference between S.P.

= ₹ 350 – ₹ 340 = ₹ 10

5% of C.P. = ₹10

100% of C.P. = $\frac{100}{5} \times 10$ = ₹ 200

8. (C) Let the distance between the two places be x km.

$\Rightarrow \frac{x}{10} + \frac{x}{6} = \frac{48}{60}$

$\Rightarrow 8x = 24 \Rightarrow x = 3$ km

9. (A) Let the numbers be x and y, then,

$x^3 = 8y^3$ .....(1)

$x^3 + y^3 = 243$ ..... (2)

Solving (1) and (2), we get

$x = 6$ and $y = 3$

$\therefore$ Difference = 6 – 3 = 3.

10. (A) Negative rational numbers are on to the left of 0 on the number line.

11. (D) Rational numbers do not satisfy commutative property under subtraction.

i.e. $a - b \neq b - a$. $\forall$ a, b$\in$ Q

12. (A) Discount = M.P. – S.P. = ₹ (x – y)

Discount% = $\frac{\text{Discount}}{\text{M. P.}} \times 100\%$

$= \frac{x - y}{x} \times 100\%$

13. (C) Volume = LBH

$24 = 2b \times b \times \frac{3}{4} \times 2b$

$b^3 = 8$ or = b = 2

24 l = 24×1000 cm^3

1 unit length = 10 cm

length of tank = $2b = 2 \times 2 \times 10 = 40$ cm

14. (B) Number of numbers less than 6 from 1 to 10 is 5.

$\Rightarrow$ Probability of the chosen a number being less than 6 is $\frac{5}{10} = \frac{1}{2}$.

15. (D) $\left(3x^2 - 5x + 6\right) \times \left[8\left(0^3\right)\right] = 0$

16. (C) $\frac{x}{x-a}-1=1-\frac{x}{x-b}$

$\frac{a}{x-a}=\frac{-b}{x-b}$

$a(x-b)=-b(x-a)$

$x(a+b)=2ab$

$x=\frac{2ab}{a+b}$

17. (D) $x\times\frac{5}{4}=\frac{15}{16}$

$x=\frac{15}{16}\div\frac{5}{4}=\frac{15}{16}\times\frac{4}{5}=\frac{3}{4}$

18. (C) Present worth $=₹\left[\frac{1}{\left(1+\frac{4}{100}\right)^2}\right]\times 169$

$=₹\left(169\times\frac{25}{26}\times\frac{25}{26}\right)=₹\ 156.25$

19. (A) % of hockey students = 100 – (83) = 17%

% of students who like tennis and table tennis = (18 + 25) = 46%

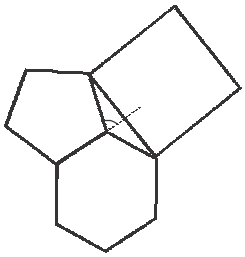
$\therefore$ 46% represents $\frac{46}{17}\times 34$ = 92 students

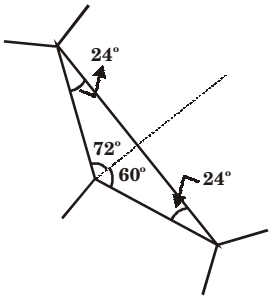
20. (A) 

21. (A) Perimeter of the triangle

= 3p – 4 + 2p – 5 + 2p + 5 = 7p – 4.

22. (C) $\frac{360^\circ}{5}=72^\circ;\ \frac{360^\circ}{6}=60^\circ$





$72^\circ + 60^\circ = 132^\circ$

$180^\circ - 132^\circ = 48^\circ$

$x^\circ = 48^\circ \div 2 = 24^\circ$

23. (B) The diagonals bisect each other perpendicularly. So, the figure is a rhombus.

24. (D) Triangle – 4, Rectangles – 4

base rectangle = 1

Total = 4 + 4 + 1 = 9

25. (A) $864\times 2 = 1728 = 12^3$.

Hence, the smallest possible value of 'n' is 2.

Physics

26. (B) When two bodies are rubbed against each other, they acquire equal and opposite charges, i.e. one body acquires positive charge while the other acquires negative charge.

27. (C) The correct ray diagram showing the formation of an image by a plane mirror is option (C).

28. (D) Air pressure is caused by the air around us that presses on the surfaces of objects.

29. (A) Sound is produced by the vibrations of air inside the bamboo.

30. (A) When a glass rod is rubbed with silk cloth, glass rod acquires positive charge whereas silk cloth acquires negative charge. A body acquires a positive charge due to the loss of electrons.

31. (A) Muscular force is used by an archer to pull a bow.

32. (A) The original liquid Z is a non-electrolyte with no ions in it to conduct. On addition of dil. H_2SO_4, the liquid can conduct electricity. Hence, the ammeter shows reading.

33. (A) Rainbow is a natural phenomenon which shows dispersion of light.

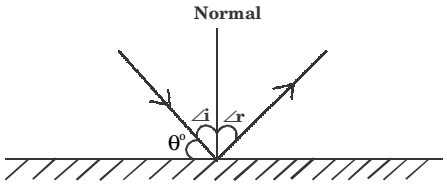
34. (B) A metal spoon is electroplated to prevent it from corrosion. It resists scratches and it also has a shiny appearance.

35. (A) The outer most layer of the earth is crust.

36. (B) Heating is not a force.

37. (B) According to the laws of reflection,

$\angle i = \angle r$



$\theta + \angle i = 90^\circ$

$\angle i = (90^\circ - \theta)^\circ$

$\therefore\ \angle r = (90 - \theta)^\circ$

38. (B) When a body is in motion, friction will tend to slow down its motion.

39. (C) A kaleidoscope can produce numerous beautiful patterns of objects.

In a kaleidoscope, three rectangular mirror strips are joined together to form a prism.

40. (D) Flute and harmonium are the instruments which produce sounds based on the vibrations of air columns of different lengths in them.

41. (D) When the magnitude of the accumulated charges becomes very large, the air which

is normally a poor conductor of electricity, is no longer able to resist their flow. Negative and positive charges (i.e.) unlike electric charges meet, producing streaks of bright light and sound. This process is called as electric discharge.

42. (B) Retina receives light and sends impulses to the brain.

Iris control the size of the pupil and therefore, the amount of light entering into the eyes.

Cornea is a transparent structure, allows light to pass inside and helps in focussing the image on the retina.

Ciliary muscles controls the thickness and focal length of the lens.

i-q, ii-s, iii-p, iv-r

43. (A) Graphite powder is used in machines as a lubricant to reduce friction due to its slippery or soapy nature.

44. (B) A lightning conductor is a device used to protect buildings from the effect of lightning. A metallic rod, taller than the building is installed in the walls of the building during its construction, one end of the rod is kept out in the air and the other end is buried deep into the ground. This rod provides easy route for the transfer of electric charges to the ground. Usually, lightning conductors are made up of copper.

45. (C) Any medium which has particles can vibrate and transmit sound. The nature of the medium will affect the speed of sound waves. In general, the speed of sound is fastest in solids and slowest in gases. Speed of sound in water (X) is 1412 m s^{-1} speed of sound in air (Y) is 332 m s^{-1} and speed of sound in steel (Z) is 5002 m s^{-1}.

46. (D) Angle between the incident ray and the reflected ray is equal to double the angle of incidence or double the angle of reflection.

$\angle i = 90 - 70 = 20^o$, $\angle r = 90 - 70 = 20^o$

$\angle i = \angle r = 20 + 20 = 40^o$

47. (C) Contact area of small cube = x^2

Let density of cube be ρ.

Volume of small cube = x^3

Mass of small cube = Volume × density

$= \rho x^3$

Weight of small cube = mg = $\rho x^3 g$

Pressure P = Force ÷ area

$= \rho x^3 g \div x^2$

$= \rho xg$

Contact area of big cube = $(4x)^2 = 16x^2$

Let density of cube be ρ.

Volume of big cube = $(4x^3) = 64x^3$

Mass of big cube = density × volume

$= \rho (64x^3)$

Weight of big cube = mg = $\rho (64x^3)g$

Pressure exerted by big cube

= Force ÷ Area

$= \rho (64x^3) \div 16x^2$

Pressure = $4(\rho xg) = 4(P)$

48. (B) The passage of an electric current through a conducting solution causes a chemical reaction.

49. (D) Water in rivers flows downward due to the force of gravity.

50. (C) On making the surfaces rough and by increasing the weight of object, friction can be increased.

Chemistry

51. (C) Magnesium is a metal which is used in crackers. Magnesium comes in contact with atmospheric oxygen to form ash of magnesium oxide. Magnesium produces a white, dazzling light during burning.

52. (A) N_2 is not an air pollutant but a major constituent of air. CO, N_2O are pollutants of air.

53. (C) The outer zone of the candle flame is the hottest part as this part is blue in colour and undergoes complete combustion.

54. (D) Rayon which has silk-like appearance is called synthetic silk.

55. (A) The spirit and kerosene lamps are made in such a way that the free end of the wicks with flame remains totally cut off from the fuel since the fuel is vaporised at room temperature and is highly inflammable.

56. (A) Nylon being a strong fibre with maximum tensile strength and least expansion can be used for rock climbing and in parachutes. The fibres used must be able to bear the weight of the person climbing and overcome gravitational force because lengthy nylon fibres are used to prevent falling and cause fatal accidents.

57. (D) Bronze, an alloy is made by combining two metals copper and tin in required proportion. Alloying prevents corrosion of metals.

58. (B) Coal tar is a black, thick liquid with an unpleasant odour. It is a petroleum product made up of nearly 200 substances.

59. (B) Acrylic is a synthetic fibre. It is cheap, durable, affordable and available in a variety of colours. It is used for making sweaters, shawls, blankets etc.

60. (A) Wood is obtained from dead trees which undergoes slow combustion on burning. Wood being a solid, compact fuel has a high ignition temperature. Till it reaches the ignition temperature, it will not start burning. After reaching that temperature, the combustion is slow on burning.

61. (B) Kerosene oil in oil lamps is regarded as more suitable than petrol because it is less volatile and has high ignition temperature. Petrol is inflammable. Petrol has a higher calorific value than kerosene oil is a true statement but not the reason for the given assertion.

62. (D) Plastic products are not degradable but they are sorted, recycled and reused.

63. (A) The calorific value of cow dung cake is 6000 – 8000 kJ/kg.

64. (B) Petrol is used as a solvent in dry cleaning.

65. (D) Teflon is a type of special plastic on which oil and water do not stick and can withstand high temperature while cooking.

66. (B) The lid cuts off the supply of oxygen to the flame and the flame goes off. Thus, oxygen is necessary for combustion.

67. (D) Diamond is a non-metal but it is hard like metals. Due to its hard nature, it can be used for cutting glass.

68. (D) An ideal fuel is cheap, readily available, readily combustible and easy to transport. It has low ignition temperature and high calorific value. It does not produce gases or residues that pollute the environment.

69. (D) Natural gas is a very important fossil fuel because it is easy to transport through pipes. It can be stored under high pressure as CNG. It is also used as a starting material for the manufacture of a number of chemicals and fertilisers. So, 'X' is natural gas.

70. (A) In terms of the calorific value of a fuel, L.P.G. is the best fuel among kerosene, coke and biogas. The calorific value of L.P.G. is 14 Cal g^{-1} to 15 Cal g^{-1}

Biology

71. (A) In the given figure 'P' represents nucleus. The nucleus controls all the activities like respiration, digestion, excretion and transfer of genes or hereditary characters.

72. (D) Euglena and Chlamydomonas possess chloroplasts and can prepare their own food hence, they are autotrophs. Rhizopus is a multicellular non-green saprophyte. It depends upon other organisms for its food hence it is a heterotroph.

73. (A) The correct combination is as follows.

Endemic : restricted to a region

Extinct : Species lost

Endangered : Towards extinction

Evolution : Coming or originating new forms.

i-r, ii-s, iii-p, iv-q

74. (B) The rearing of animals to obtain food from them is called animal husbandry.

75. (C) The crops that are grown between October to March are called rabi crops. Examples of rabi crops are wheat, gram, pea, mustard and linseed.

76. (D) Aspergillus is a mould common on rotten fruits, bread, butter, cheese leather and other decaying matter. Mould's cause skin diseases in man. Aspergillosis is a disease of the throat caused by spores of a aspergillus.

77. (A) Mixed farming includes raising both plant crops and livestock on farm.

78. (C) The gametes have only of sex chromosome. When Y chromosome of sperm fuses with an X chromosome of an egg it develops into a male child.

79. (B) Hydra reproduces by budding. There may be one or more bulges or outgrowths on the parent's body. These outgrowths, when developed, get detached from the parent 's body and leads an independent life.

80. (D) Virus cause measles. Cholera is a water borne bacterial disease. Plasmodium causes malaria.

81. (A) Vegetable peels and fruits are biodegradable (organic) wastes. Biodegradable wastes are converted into simple substances like manure by the microorganisms by the process of decay.

82. (B) Boys develops larger voice box (larynx) that can be seen as protruding part of the throat called Adam's apple and develop a deep voice. Girls have high pitched voice and there is no enlargement of larynx.

83. (C) Frogs are amphibians. A frog lays hundreds of uncovered eggs. A layer of jelly holds the eggs together and provides protection to the egg and they undergo external fertilisation.

84. (B) Lactobacillus bacteria promotes the formation of curd.

85. (D) Combine is a machine that is used to remove or separate grain seeds from chaff.

86. (C) Rhizobium fixes atmospheric nitrogen into the soil. It is present in the root nodules of leguminous plants.

87. (D) The changes that take place at the time of the formation of an adult from a larva is called metamorphosis. Metamorphosis occurs in the life cycle of insects and frog. If the water in which tadpoles are growing does not contain sufficient iodine the tadpole cannot become an adult. Thyroxine production requires the presence of the iodine in water.

88. (D) Sodium benzoate and sodium metabisulphite are common preservatives. These are used in jams and squashes as food preservative.

89. (C) The fertilisation of an egg by a sperm leads to the formation of a zygote.

90. (A) When plants and animals die, bacteria and fungi present in the soil convert the nitrogenous wastes into nitrogenous compounds.