



NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION (UPDATED)

CLASS - 8
Question Paper Code : UN499

KEY

1. A	2. B	3. C	4. A	5. D	6. C	7. D	8. B	9. D	10. C
11. B	12. B	13. C	14. B	15. B	16. C	17. C	18. B	19. B	20. A
21. C	22. C	23. C	24. A	25. B	26. D	27. D	28. A	29. D	30. B
31. D	32. D	33. B	34. C	35. A	36. D	37. D	38. B	39. D	40. D
41. B	42. D	43. C	44. B	45. C	46. D	47. B	48. C	49. D	50. A
51. C	52. B	53. D	54. D	55. C	56. C	57. B	58. C	59. B	60. C

SOLUTIONS

MATHEMATICS

1. (A)

$$\begin{array}{r|l}
 8 & 65.0000 \\
 & 64 \\
 \hline
 160 & 100 \\
 & 0 \\
 \hline
 1606 & 10000 \\
 & 9636 \\
 \hline
 & 364
 \end{array}
 \quad 8.06$$

$$\begin{array}{r|l}
 7 & 63.00\ 00 \\
 & 49 \\
 \hline
 149 & 1400 \\
 & 1341 \\
 \hline
 1583 & 5900 \\
 & 4749 \\
 \hline
 & 1151
 \end{array}
 \quad 7.93$$

$$\therefore \sqrt{65} - \sqrt{63} = 8.06 - 7.93 = 0.13$$

02. (B) Volume of wood = Volume of outer box
 – Volume of the air the box
 $= 12 \times 10 \times 8 \text{ cm}^2 - (12 - 2)$
 $(10 - 2)(8 - 2)\text{cm}^3$
 $= 960 \text{ cm}^3 - 480\text{cm}^3$
 $= 480 \text{ cm}^3$

03. (C) Given $x^{x\sqrt{x}} = (\sqrt{x^3})^x$

$$x^{x\sqrt{x}} = (x^{\frac{3}{2}})^x$$

$$\therefore x\sqrt{x} = \frac{3x}{2}$$

$$\sqrt{x} = \frac{3\cancel{x}}{2\cancel{x}} = \frac{3}{2}$$

Squaring on both sides

$$x = \frac{9}{4}$$

04. (A) $h = \frac{\text{Volume}}{l \times b} = \frac{154.105\text{cm}^3}{4.9 \times 8.5\text{cm}^2} = 3.7\text{cm}$

05. (D) LCM of ab^2, bc^2, ca^2 is $a^2b^2c^2$

06. (C) $(a-1)(a+1)(a^2+1)(a^4+1)(a^8+1)$
 $= (a^2-1)(a^2+1)(a^4+1)(a^8+1)$
 $= (a^4-1)(a^4+1)(a^8+1)$
 $= (a^8-1)(a^8+1)$
 $= a^{16} - 1$

07. (D) $2^8 + 1 = 256 + 1 = 257$

$$\therefore 2^{18} + 1 = (2^6)^3 + 1 = 64^3 + 1$$

$$257 < 7^3 < 64^3 < 64^3 + 1$$

$$\therefore \text{No. of perfect cubes} = 64 - 7 + 1 = 58$$

08. (B) First term

$$= \sqrt{1 + 1 + \frac{1}{4}} = \sqrt{\frac{9}{4}} = \frac{3}{2} = 2 - \frac{1}{2}$$

Sum of first two terms =

$$\frac{3}{2} + \sqrt{1 + \frac{1}{4} + \frac{1}{9}}$$

$$= \frac{3}{2} + \sqrt{\frac{36+9+4}{36}} = \frac{3}{2} + \frac{7}{6} = \frac{9+7}{6} = \frac{16}{6}$$

$$= 3 - \frac{1}{3}$$

Sum of first three terms

$$= \frac{8}{3} + \sqrt{1 + \frac{1}{9} + \frac{1}{16}} = \frac{8}{3} + \frac{13}{12}$$

$$\frac{45}{12} = \frac{15}{4} = 4 - \frac{1}{4}$$

$$\therefore \text{Sum of all terms} = 2021 - \frac{1}{2021}$$

09. (D) $\sqrt{(1234567)^2 - 2469133}$
 $= \sqrt{(1234567)^2 - 2469133 - 1 + 1}$
 $= \sqrt{(1234567)^2 - 2469134 + 1}$
 $= \sqrt{(1234567)^2 - 2(1234567)(1) + 1^2}$
 $= \sqrt{(1234567 - 1)^2}$
 $= 1234566$

10. (C) $(6x+7)(2x+3) = (4x+5)(3x+2)$
 $12x^2 + 18x + 14x + 21$
 $= 12x^2 + 8x + 15x + 10$
 $9x = -11$
 $x = -\frac{11}{9}$

11. (B) $\text{LHS} = \left(\frac{\frac{1}{x} + \frac{1}{y}}{\frac{1}{x}} \right)^{-1} - \left(\frac{\frac{1}{x} - \frac{1}{y}}{\frac{1}{x}} \right)^{-1}$

$$= \left(\frac{x+y}{\cancel{x}y} \times \cancel{x} \right)^{-1} - \left(\frac{y-x}{\cancel{x}y} \times \cancel{x} \right)^{-1}$$

$$= \frac{y}{x+y} - \frac{y}{y-x} = \frac{y^2 - xy - xy - y^2}{y^2 - x^2}$$

$$= \frac{-2xy}{y^2 - x^2} = \frac{2xy}{x^2 - y^2}$$

12. (B) Area of shaded region

$$= 15 \times 8\text{cm}^2 - \frac{1}{2} \times 12 \times 8\text{cm}^2$$

$$= 120\text{ cm}^2 - 48\text{ cm}^2$$

$$= 72\text{ cm}^2$$

13. (C) Let cost price be ₹ 100. Then M.P. is ₹ 130. After discount of $6\frac{1}{4}\%$ the S.P. is

$$\text{₹} 130 \left(\frac{93.75}{100} \right)$$

$$= \text{₹} 121.875$$

$$\text{Gain\%} = \frac{\text{S.P.} - \text{C.P.}}{\text{C.P.}} \times 100\%$$

$$\Rightarrow \text{Gain\%} = \frac{121.875 - 100}{100} \times 100\%$$

$$= 21.875\%$$

14. (B) Let length be $5x$ m and breadth be $3x$ m.

$$\text{Area} = l \times b = 5x \times 3x \text{ sq m.}$$

$$= 15x^2 \text{ sq m.}$$

We have,

$$15x^2 = 3.75 \text{ hectares} = 37500 \text{ sq m}$$

(Since 1 hectare = 10000 sq m)

$$\Rightarrow x^2 = \frac{37500}{15} = 2500$$

$$\Rightarrow x = 50 \text{ m}$$

$$\therefore \text{Perimeter} = 2(l + b)$$

$$= 2(250 + 150) = 800 \text{ m}$$

$$\text{Cost of fencing} = 800 \times \text{₹} 5 = \text{₹} 4000$$

15. (B) $(x^2 - 3x + 7)(2x + 3) = x^2(2x + 3) - 3x(2x + 3) + 7(2x + 3)$

$$= 2x^3 + 3x^2 - 6x^2 - 9x + 14x + 21$$

$$= 2x^3 - 3x^2 + 5x + 21$$

16. (C) Area = $l \times b = (a^2 + b^2 + c^2 + ab - bc + ca)(a - b - c)$ units²

$$= [a^2(a - b - c) + b^2(a - b - c) + c^2(a - b - c) + ab(a - b - c)]$$

$$= a^3 - a^2b - a^2c + ab^2 - b^3 - b^2c - c^2a - bc^2 - c^3 + a^2b - ab^2 - abc - abc + b^2c + bc^2 + a^2c - abc - c^2a$$

$$= a^3 - b^3 - c^3 - abc - abc - abc - a^2b + a^2b - c^2c + a^2c + ab^2 - ab^2 - b^2c + b^2c + c^2a - c^2a - bc^2 + bc^2$$

$$= (a^3 - b^3 - c^3 - 3abc) \text{ units}^2$$

17. (C) Let the edge of cube be 'a' units

$$\therefore \text{Surface area} = 6a^2.$$

$$\text{Given } A = a + 40\% a = a \frac{(140)}{100} = \frac{7a}{5}$$

New surface area =

$$6A^2 = 6 \times \left(\frac{7a}{5} \right)^2 = 6 \times \frac{49a^2}{25}$$

$$\therefore \text{Increased area} = 6a^2 \left(\frac{49}{25} \right) - 6a^2$$

$$= 6a^2 \left[\frac{49}{25} - 1 \right]$$

$$= 6a^2 \left[\frac{49 - 25}{25} \right]$$

$$= 6a^2 \frac{(24)}{25}$$

Percentage of increased area

$$= \frac{6a^2 \left(\frac{24}{25} \right)}{6a^2} \times 100$$

$$= 96\%$$

18. (B) Let the first odd number be x

$$\therefore x + (x + 2) + (x + 4) + (x + 6) + (x + 8) = 675$$

$$5x + 20 = 675$$

$$5x = 675 - 20 = 655$$

$$x = \frac{655}{5} = 131$$

$$\therefore \text{Smallest odd number} = x = 131$$

PHYSICS

19. (B) Let no. of notes of ₹50 be x .
∴ No. of notes of ₹10 = $2x$
∴ No. of notes of ₹5 = $4x$
Amount of ₹50 = ₹ $50x$
Amount of ₹10 = ₹ $20x$
Amount of ₹5 = ₹ $20x$
Total money = ₹ $50x + ₹20x + ₹20x$
= ₹ $90x$
Given ₹ $90x = ₹1350$
$$x = \frac{1350}{90} = 15$$

Amount of ₹5 = ₹ $20x = ₹20 \times ₹15 = ₹300$
20. (A) $(xy)(yz)(zx) = 8.4 \times 16.1 \times 276$
 $(xyz)^2 = 37326.24$
 $(xyz)^2 = \sqrt{37326.24} = 193.2$
21. (C) Given the ratio of length, breadth and height = $1 : 3 : 4$
= $x : 3x : 4x$
∴ Volume = $x \times 3x \times 4x = 12x^3$
Volume should be in form of $12x^3$
∴ Volume = 96cm^3 [$\because 12 \times 8\text{cm}^3$]
22. (C) $\sqrt{16\sqrt{8} \times \sqrt{4}} = \sqrt{6\sqrt{8} \times 2} = \sqrt{16 \times 4} = \sqrt{64} = 8$
23. (C) Given $a - x = \sqrt{x^2 + 1}$
squaring on both sides
 $(a - x)^2 = (\sqrt{x^2 + 1})^2$
 $a^2 - 2ax + x^2 = x^2 + 1$
 $a^2 - 1 = 2ax$
$$2x = \frac{a^2 - 1}{a} = a - \frac{1}{a} = (a - a^{-1})$$

∴ $x = \frac{1}{2}(a - a^{-1})$
24. (A) $6x^2 - 5\sqrt{2}x - 12 = 6x^2 - 9\sqrt{2}x + 4\sqrt{2}x - 12$
 $= 3\sqrt{2}x(\sqrt{2}x - 3) + 4(\sqrt{2}x - 3)$
∴ $6x^2 + 5\sqrt{2}x - 12 = (\sqrt{2}x - 3)(3\sqrt{2}x + 4)$
25. (B) Each monkey eat each banana 12 minutes.

26. (D) The speed of sound in air depends on air conditions such as temperature, pressure, type of gases and wind conditions. Amplitude, frequency and wavelength of sound in air usually depends on the vibrating source.
Under the same air conditions, all the given activities produce sound waves that travel with the same speed.
27. (D) To increase the force of his shots to shoot some fruits from a tree, he should use more effort to stretch the elastic band of the catapult.
28. (A) As the metal rod is an earthed conductor, it cannot be charged by friction. The rest however are insulators which can be charged by friction.
29. (D) The force needed to push the box is minimum on surface S. Therefore, friction is least on this surface.
30. (B) Statements (A), (C) and (D) are not correct. An LED glows even when a weak electric current flows through it.
31. (D) If one student can see another student, both the students can see each other. For example, student Y can see both the students X and Z. Also student X can see both the students Y and Z. Hence, each student can see all the other students.
32. (D) The pressure exerted by a liquid is dependent on the vertical depth of the liquid. From the given diagrams, the water level of each vessel has the same vertical height.
So, water exerts the same pressure on the base of each vessel.
33. (B) Among the given solutions, sodium chloride is a strong electrolyte because it ionizes completely. NaCl (Sodium chloride) solution allows current to pass through it as it contains positively charged sodium (Na^+) and negatively charged chloride (Cl^-) ions. When current is passed through strong electrolyte like sodium chloride, the bulb will glow the brightest. Ammonium

hydroxide and ethanoic acid are weak electrolytes because they do not ionize completely. So, the bulb does not glow brightly when weak electrolytes are used. Alcohol is a non-electrolyte as it has no ions to conduct electricity.

34. (C) Talcum powder on sprinkling on the wooden surface makes it slippery and reduces frictional force, then the ball will cover trowel longer distance.
35. (A) As the shiny aluminum foil is pasted on the outer surface of the ball, it behaves like a convex mirror. A candle placed in front of this shiny surface forms an image which is virtual, erect and smaller in size

CHEMISTRY

36. (D) Petrol (i) is used in automobiles, as aviation fuel and as solvent in dry cleaning clothes. For proper functioning of machine parts Lubricating oil (ii) is used. Paraffin wax (iii) has wide use in ointments, vaseline etc., Kerosene (iv) is used as fuel in jet aircrafts.
37. (D) Incomplete combustion of a fuel results in the formation of unburnt carbon and some poisonous gases like 'CO' and oxides of nitrogen which cause air pollution leading to many respiratory problems.
38. (B) The outer most part (non - luminous) of the flame is blue. It is the hottest part in the flame because of complete combustion of fuel. Due to high temperature, it can melt metals of high melting point like gold easily.
39. (D) Coal causes air pollution when burnt in the form of smoke.
40. (D) 1 kg of fuel when burnt gives 20,000 joules of heat energy.
50,000 joules of heat energy will be produced by 2.5 kg of fuel as given below.
1 kg fuel produces 20 kJ kg⁻¹ heat
? fuel produces 50 kJ kg⁻¹ heat

$$= \frac{50000}{20000} = 2.5 \text{ kg}$$

41. (B) As CNG is less polluting and a cleaner fuel it is used as a fuel in transport vehicles.
42. (D) All the given advantages of gaseous fuels are safe for cooking at home.
43. (C) Butane is an odourless gas, so it is mixed with ethyl mercaptan such that if the gas leaks in air, it can be easily detected due to its peculiar choking smell and prevents it from explosion.
44. (B) Spontaneous combustion is the ability of a material or a material that suddenly bursts into flames without any flame, spark, heat or igniting source. Examples: Phosphorus, piles of hay, straw, manure etc., (takes place without any external source of heat).
45. (C) Kerosene is obtained by fractional distillation of crude petroleum.

BIOLOGY

46. (D) All the given statements relate to the advantages of adding manure to the soil.
47. (B) The correct matching is
a-(vi), b-(iv), c-(v), d-(iii), e-(ii), f-(i)
Nitrogen fixation - Rhizobium
Polio - Virus
Setting of curd - Lactobacillus
Used in idli and dosa - Yeast
Possesses pseudopodia- Amoeba
Typhoid - Bacteria
48. (C) The advantages of conducting conservation programmes for flora and fauna are:
(i) They protect the ecosystem from destruction.
(ii) They prevent the depletion of natural resources.
(iii) They maintain the population of endangered plant and animal species.

49. (D) X is an oviparous animal that lays fertilised eggs and Y is a viviparous animal that gives birth to young ones. Brooding may occur in case of animal X and parturition occurs in case of animal Y. Young ones of animal X may or may not resemble its parents but young ones of animal Y resemble its parents. Metamorphosis may occur in oviparous animals (X) where newly hatched young ones do not resemble their parents. Crocodile is oviparous animal and newly hatched young ones resemble parents. Dog is a viviparous animal that gives birth to young ones. **Animal X could be crocodile and animal Y could be dog.**
50. (A) X is sperm and Y is Ovum. Both sperm(X) and ovum (Y) are reproductive single cells in humans.
51. (C) The consequences of deforestation are
- I. It increases the level of carbon dioxide in the atmosphere.
 - II. Ground water level also gets lowered.
 - III. It increases the temperature and pollution level on the earth.
 - IV. It causes natural calamities like floods and droughts.
52. (B) In the case of humans, whale and dog, all the three have to undergo sexual reproduction involving two parents (male and female) to produce a new individual. Rest of them undergo asexual reproduction.
53. (D) According to the given information, X is manure and Y is fertiliser. Manures are not readily soluble in water, thus it is absorbed slowly by the plants. Fertilisers are soluble in water and are absorbed readily by the plants.

54. (D) Certain bacteria present in the soil fix nitrogen from the atmosphere and convert it into the compounds of nitrogen. These are utilised by the plants from the soil through their root system.

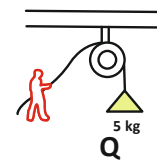
During lightning, the atmospheric nitrogen reacts with oxygen present in the air to form nitric acid that reach the earth along with rain water and reacts with water to form nitrates that are absorbed by the plants.

The bacterium called Rhizobium lives in the root nodules of leguminous plants. This bacteria convert atmospheric nitrogen to ammonia in the usable form for the growth and development of the plant.

55. (C) P could be any traditional method of irrigation like moat, chain pump, dhikli, rahat, etc., whereas Q could be a modern method of irrigation like drip system.

CRITICAL THINKING

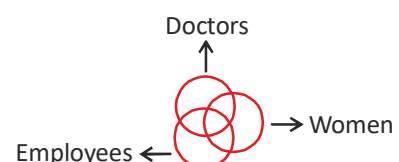
56. (C) R's stole the diamond.



57. (B) apply the minimum force.

58. (C) Physical force can accomplish a task by compulsion, while the influential writings can mould the thinking of an individual and change his discretion into accomplishing the task willfully. Yet pens don't win battles and swords don't write poetry, but mighty is the mind in fact the hand that knows when to pick the pen and when to pick the sword. The instance or the motive is not specific in the question and hence either I or II can be considered strong.

59. (B)



60. (C) THAT