



NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION (UPDATED)

CLASS - 8

Question Paper Code : UN497

KEY

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

SOLUTIONS

MATHEMATICS

01. (D) $\frac{1}{4} = 0.25; \frac{1}{3} = 0.33; \frac{8}{15} = 0.53$

$\frac{7}{24} = 0.29; \frac{13}{48} = 0.27$

So $\frac{7}{24}$ and $\frac{13}{48}$ lie between $\frac{1}{4}$ & $\frac{1}{3}$

02. (C) $2^{30} + 2^{30} + 2^{30} + 2^{30}$
 $= 2^{30} (4)$
 $= 2^{30} \times 2^2$
 $= 2^{32}$

03. (D) $\pi r_1^2 h_1 = \pi r_2^2 h_2$

Given $\frac{h_1}{h_2} = \frac{2}{1}; \left(\frac{r_1}{r_2}\right)^2 = \frac{h_1}{h_2} = \frac{1}{2}$

$\Rightarrow \frac{r_1}{r_2} = \frac{1}{\sqrt{2}}$

$\therefore r_1 : r_2 = 1 : \sqrt{2}$

04. (B) Since $x + xy = 391$, then $x(1 + y) = 391$.

We note that $391 = 17 \times 23$

Since 17 and 23 are both prime, then if 391 is written as the product of two positive integers, it must be 1×391 or 17×23 or 23×17 or 391×1 .

Matching x and $1 + y$ to these possible factors, we obtain $(x, y) = (1, 390)$ or $(17, 22)$ or $(23, 16)$ or $(391, 0)$.

Since y is a positive integer, the fourth pair is not possible.

Since $x > y$, the first two pairs are not possible.

Therefore, $(x, y) = (23, 16)$

$$\Rightarrow x + y = 39$$

05. (A) $a = 6$ as

$$6^3 = 3^3 + 4^3 + 5^3$$

06. (C) New area = $\left(l + \frac{5}{100}l\right)\left(b - \frac{5}{100}b\right)$

$$= l \times \frac{21}{20} \times b \times \frac{19}{20}$$

$$= \frac{399}{400}lb$$

$$\text{Decreased area} = lb - \frac{399}{400}lb = \frac{lb}{400}$$

Decreased area %

$$= \left(\frac{\frac{lb}{400}}{lb}\right) \times 100 = \frac{1}{4}\% = 0.25\%$$

07. (B) If the lines are parallel, then sum of the interior angles lie same side to the transversal are supplementary.

$$\therefore 3x + 20^\circ + 5x - 24^\circ = 180^\circ$$

$$8x - 4^\circ = 180^\circ \Rightarrow 8x = 180 + 4$$

$$8x = 184^\circ$$

$$x = \frac{184^\circ}{8} = 23^\circ.$$

08. (D) Let the principal be P

$$\text{Given } P\left(1 + \frac{r}{100}\right)^3 = ₹10,648 \quad \dots (1)$$

$$P\left(1 + \frac{r}{100}\right)^2 = ₹9,680 \quad \dots (2)$$

$$\therefore \frac{\text{eq(1)}}{\text{eq(2)}} \Rightarrow \frac{P\left(1 + \frac{r}{100}\right)^3}{P\left(1 + \frac{r}{100}\right)^2} = \frac{₹10,648}{₹9,680}$$

$$\therefore \left(1 + \frac{r}{100}\right)^{3-2} = \frac{10,648}{9680}$$

$$\frac{r}{100} = \frac{10,648}{9680} - 1$$

$$= \frac{10,648 - 9680}{9680} = \frac{968}{9680} = \frac{1}{10}$$

$$\therefore r = \frac{100}{10} = 10\%$$

09. (A) $25920 = 2^6 \times 3^4 \times 5$

25920 is to be divided by 3×5
i.e., 15 to make a perfect cube

10. (D) SP of first cycle = ₹ 1188

Profit = 30%

$$\therefore \frac{CP(100 + P)}{100} = SP$$

$$\frac{CP(100 + 30)}{100} = ₹1188$$

$$CP \times \frac{13}{10} = ₹1188$$

$\therefore$ CP of first cycle (CP_1)

$$= \frac{₹1188 \times 10}{13} = \frac{₹11880}{13}$$

SP of second cycle = ₹ 1188

$$\therefore \frac{CP(100 - l)}{100} = ₹1188$$

$$\frac{CP(100 - 30)}{100} = ₹1188$$

∴ CP of second cycle (CP)

$$= ₹1188 \times \frac{10}{7} = \frac{₹11880}{7}$$

∴ Total CP

$$= \frac{₹11880}{13} + \frac{₹11880}{7} = ₹11880 \left(\frac{1}{13} + \frac{1}{7} \right)$$

$$= ₹11880 \times \frac{20}{91}$$

∴ Total SP = $2 \times ₹1188 = ₹2376$

∴ Total loss = Total CP – total SP

$$= ₹11880 \times \frac{20}{91} - ₹2376$$

$$= \frac{237600 - 216216}{91}$$

$$= \frac{₹21384}{91}$$

Total loss percentage

$$= \frac{\left(\frac{₹21384}{91} \right)}{\left(\frac{₹11880 \times 20}{91} \right)} \times 100 = \frac{18}{2} = 9\%$$

11. (B) Let the number be 'x'

$$\text{Given } \left(\frac{0.5x}{3} \right)^2 + 1 = 26$$

$$\left(x \times \frac{5}{10} \times \frac{1}{3} \right)^2 = 26 - 1 = 25$$

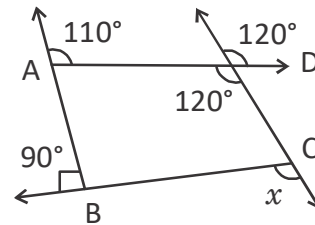
$$\left(\frac{x}{6} \right)^2 = 5^2$$

$$x = 6 \times 5 = 30$$

$$12. (C) \quad x^2 + 4 + \frac{1}{x^2 - 4} = \frac{x^4 - 16 + 1}{x^2 - 4}$$

$$= \frac{x^4 - 15}{x^2 - 4}$$

13. (C)



$$\angle BAD = 70^\circ, \angle ADC = 120^\circ$$

$$\angle ABC = 90^\circ, \angle BCD = 180^\circ - x$$

But ABCD is a quadrilateral

$$\therefore 70^\circ + 90^\circ + 180^\circ - x + 10^\circ = 360^\circ$$

$$460^\circ - 360^\circ = x$$

$$\therefore x = 100^\circ$$

$$14. (D) \quad 3^{25} + 3^{26} + 3^{27} + 3^{28} = 3^{25} (1 + 3 + 3^2 + 3^3)$$

$$= 3^{25} (4 + 9 + 27)$$

$$= 3^{25} \times 40$$

$$= 3 \times 3^{24} \times 10 \times 4$$

$$= 30 \times 4 \times 3^{24}$$

15. (C) Interest for 3 years =

$$₹1200 - ₹1125 = ₹75$$

$$\text{Interest for 1 year} = \frac{₹75}{3}$$

$$= ₹25$$

$$\text{Interest for 5 years} = 5 \times ₹25$$

$$= ₹125$$

$$\therefore P = A - I$$

$$= ₹1125 - ₹125$$

$$= ₹1000.$$

16. (D) Originally, let there be x men. Less men
⇒ more days.

$$\therefore (x - 10) : x :: 100 : 110$$

$$\Rightarrow (x - 10) \times 110 = x \times 100$$

$$\Rightarrow 10x = 1100 \Rightarrow x = 110$$

17. (B) Value of the car after 2 years

$$= ₹2,70,000 \left(\frac{100 - 5}{100} \right) \left(\frac{100 - 5}{100} \right)$$

$$= ₹2,70,000 \times \frac{95}{100} \times \frac{95}{100}$$

$$= ₹2,43,675$$

18. (C) If 'n' is even then square root will contain $\frac{n}{2}$ digits.

If 'n' is odd then square root will contain $\frac{n+1}{2}$ digits.

$$\begin{aligned}
 19. (A) \quad & \frac{(-1)^{13}}{2^3} + \frac{2^3 - 1^{10} + 3^2}{3^2 - 2^2} + \left(\frac{7}{11}\right)^3 \div \frac{98}{121} \\
 &= \frac{-1}{8} + \frac{8-1+9}{9-4} + \frac{343}{1331} \times \frac{121}{98} \\
 &= \frac{-1}{8} + \frac{16}{5} + \frac{7}{11} \times \frac{1}{2} \\
 &= \frac{-1}{8} + \frac{16}{5} + \frac{7}{22} \\
 &= \frac{-5+128}{40} + \frac{7}{22} \\
 &= \frac{123}{40} + \frac{7}{22} = \frac{1353+140}{440} = \frac{1493}{440} = 3\frac{173}{440}
 \end{aligned}$$

$$\begin{aligned}
 20. (D) \quad & A : B : C = \\
 & \frac{1}{6} : \frac{1}{4} : \frac{1}{3} = \frac{1}{6} \times 12 : \frac{1}{4} \times 12 : \frac{1}{3} \times 12 \\
 &= 2 : 3 : 4
 \end{aligned}$$

$$B's \text{ share} = \frac{3}{9} \times ₹ 207 = ₹ 69$$

$$\begin{aligned}
 21. (A) \quad & 1 + a + b + c + ab + bc + ca + abc \\
 &= (1 + a) + b + c + ab + ca + bc + abc \\
 &= (1 + a) + (b + c) + a(b + c) + bc(1 + a) \\
 &= (1 + a) + (b + c)(1 + a) + bc(1 + a) \\
 &= (1 + a)(1 + b + c + bc) \\
 &= (1 + a)\{(1 + b) + c(1 + b)\} \\
 &= (1 + a)(1 + b)(1 + c) \\
 & \text{(OR) Short cut multiply options.}
 \end{aligned}$$

$$22. (D) \quad x - \frac{1}{x} = \sqrt{6}$$

Squaring on both sides, we get

$$\left(x - \frac{1}{x}\right)^2 = (\sqrt{6})^2$$

$$\Rightarrow x^2 + \frac{1}{x^2} - 2 \cdot x \cdot \frac{1}{x} = 6$$

$$\Rightarrow x^2 + \frac{1}{x^2} = 6 + 2 = 8$$

23. (A)

$$\begin{aligned}
 \text{LHS} &= \left(\frac{9x}{7} - 7\right)\left(\frac{7x}{9} + 3\right) - \left(\frac{3x}{5} - 8\right)\left(\frac{5x}{3} + 7\right) \\
 &= \frac{9x}{7}\left(\frac{7x}{9} + 3\right) - 7\left(\frac{7x}{9} + 3\right) - \left[\frac{3x}{5}\left(\frac{5x}{3} + 7\right) - 8\left(\frac{5x}{3} + 7\right)\right] \\
 &= \frac{\cancel{9}x}{\cancel{7}} \times \frac{\cancel{7}x}{\cancel{9}} + \frac{9x \times 3}{7} - \frac{49x}{9} - 21 - \left[x^2 + \frac{21x}{5} - \frac{40x}{3} - 56\right] \\
 &= x^2 + \frac{27x}{7} - \frac{49x}{9} - 21 - x^2 - \frac{21x}{5} + \frac{40x}{3} + 56 \\
 &= \frac{27x}{7} - \frac{49x}{9} - \frac{21x}{5} + \frac{40x}{3} - 21 + 56 \\
 &= \frac{(1215 - 1715 - 1323 + 4200)}{315} x + 35 \\
 &= \frac{2377}{315} x + 35
 \end{aligned}$$

$$24. (C) \quad \sqrt{\frac{0.16}{0.4}} = \sqrt{\frac{0.16}{0.40}} = \sqrt{\frac{16}{40}} = \sqrt{\frac{4}{10}}$$

$$= \sqrt{0.4} = \sqrt{0.40}$$

$$= \sqrt{\frac{40}{100}} = \frac{\sqrt{40}}{10} = \frac{6.3}{10} = 0.63$$

$$\begin{aligned}
 25. (C) \quad & \sqrt{2x^2 - 2\sqrt{6}xy + 3y^2} \\
 &= \sqrt{(\sqrt{2}x)^2 - 2(\sqrt{2}x)(\sqrt{3}y) + (\sqrt{3}y)^2} \\
 &= \sqrt{(\sqrt{2}x - \sqrt{3}y)^2} \\
 &= (\sqrt{2}x - \sqrt{3}y)
 \end{aligned}$$

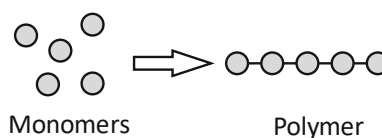
PHYSICS

26. (A) All sound waves travelling in any type of medium are longitudinal. Speed of sound in glass is 4540 m/s. Speed of sound in solids is faster than in liquids. Speed of sound in air is the slowest.
27. (C) As the paper clip moved up the ramp, frictional force, magnetic force and gravitational force acted on it.
28. (C) The isolated metal sphere is charged by electrostatic induction. Then one set of induced charges is removed by earthing. During earthing, the charged rod must not be removed. After the removal of the earth connection, the charged rod can be removed.
29. (C) Frictional force, F will act in the opposite direction to the downward motion of the block of wood along the ramp, i.e., upwards
- Normal force N will be acting in the perpendicular direction to the slope.
- Weight W will always be in the vertical downward direction.
30. (D) The bulb does not glow as diluted sugar solution does not dissociate into ions. Solutions of sodium chloride, copper sulphate and silver nitrate are good electrolytes whereas sugar solution in diluted water is a non-electrolyte.
31. (D) Cataract occurs in old age in human eyes due to the given characteristics.
32. (A) Area of the liquid surface does not affect the pressure beneath the surface of a liquid. Liquid pressure = $h\rho g$, where h is depth of liquid, ρ is density of liquid and g is the strength of the gravity.
33. (D) In electroplating factory, the disposal of the used conducting solution is a major concern because it is a polluting waste. Therefore, it should be disposed off according to the disposal guidelines of the local authority.

34. (B) As per the given graph, when a heavy box was moved over a polished marble surface, it offered less friction due to smoothness by polishing. When the same heavy box was moved over a carpet, due to uneven surface there was more friction. More force was applied when a heavy box was moved over carpet when compared with polished marble surface.
35. (A) A tiny mirror will be visible when a ray of light from the bulb strikes the mirror M . The mirror M will reflect back the light such that the angle of incidence is equal to the angle of reflection. In other options, the mirror is not visible as the position of bulb, eye and mirror do not obey the laws of reflection of light i.e., angle of incidence is not equal to the angle of reflection.

CHEMISTRY

36. (D) Coal tar is used as a starting material for manufacturing synthetic dyes, drugs, naphthalene, explosives, perfumes, plastics, paints, photographic and roofing materials.
37. (B) A Copper article when exposed to moist air forms a green coating due to corrosion. Its surface gets covered with a layer of copper hydroxide and copper carbonate.
38. (D) Carbon monoxide which binds to the haemoglobin prevents oxygen from binding. This causes reduction in the amount of oxygen circulated in the blood which in turn causes inadequate amount of oxygen distributed to the body. Carbon monoxide is poisonous. However it is difficult for us to detect due to its colourless, odourless and tasteless property.
39. (C) A polymer is a macromolecule, (big molecule) which is made up of repeating units (monomers) bonded chemically together.



BIOLOGY

40. (A) Metal P reacts both with water and dilute hydrochloric acid. Metal Q does not react with water but reacts with dilute hydrochloric acid. Metal R does not react with water and dilute hydrochloric acid. P, Q, R is the correct order of reactivity in a decreasing order of given metals.
41. (C) The correct combination is
a – 3, b – 4, c – 2, d – 1
- (i) Dark inner zone – Unburnt vapours of wax
- (ii) Blue zone – Complete combustion
- (iii) Luminous zone – Partial combustion
- (iv) Non-luminous zone – Hottest part (no carbon)
42. (B) As the mass of material Q does not change much when it is soaked in water, it is the least absorbent material. A swim suit should be made up of the least absorbent material so that water does not add much to the mass of the swim suit.
43. (C) Aluminium, being high in the reactivity series, is a very reactive metal. It can readily react with oxygen in the air to form an oxide layer which helps prevent further corrosion.
44. (D) Combustion of most of the fuels releases carbon dioxide into the atmosphere. If the concentration of this gas increases, it causes global warming. Global warming leads to a rise in atmospheric temperature and melts the ice on polar ice caps, glaciers etc., causing an increase in the sea level which is the main reason for flooding surrounding areas.
45. (B) Coke (X) is a tough, porous and black substance. Coal tar (Y) is a black liquid with unpleasant smell. Coal gas (Z) is obtained during processing of coal to get coke.
46. (B) The (ii) and (iii) are wrongly described.
47. (D) The basic need(s) for the conservation of biodiversity:
- (i) Biodiversity maintains balance in the ecosystem.
- (ii) Wild animals and plants provide a variety of commodities.
- (iii) Wildlife is needed for breeding programmes.
48. (D) X - Chlorophyll, Y - Respiration, Z - in damp places.
49. (B,D) Both plant and bacterial cell has cell wall. Vacuoles are found in both plant cell & animal cell.
50. (D) The labelling Y is fallopian tube.
51. (B) For the given figure, P is larynx (voice box), Q is thyroid gland and R is trachea (windpipe).
52. (B) Asexual reproduction involves a single parent. The progeny of asexual reproduction can be termed as clones. Asexual reproduction is relatively faster than sexual reproduction and the progenies are identical to the parent as well as with each other.
53. (D) The human nerve cell receives and transfers messages from various body parts to brain and brain to various parts of the body. Thus, they help to control and coordinate the working of different parts of the body.
54. (C) Ammonia is first oxidized to nitrite by the bacteria Nitrosomonas.
55. (D) The method of broadcasting is cost effective, but it is not advisable as:
- (i) The seed distribution is uneven
- (ii) The density and depth of seeds are uneven
- (iii) The germination of seed is not uniform.

CRITICAL THINKING

56. (C)



57. (B)

Let's break down the information step by step:

"Ravi has less money than Rahul." This means Rahul has more money than Ravi.

"Ravi and Rahul together have as much as Rakesh and Ramesh together." This tells us that the combined wealth of Ravi and Rahul is equal to the combined wealth of Rakesh and Ramesh. So, the total wealth of Ravi and Rahul is the same as the total wealth of Rakesh and Ramesh.

"Rakesh and Rahul together have less money than Ramesh and Ravi together." This means that when Rakesh and Rahul combine their wealth, it is less than the combined wealth of Ramesh and Ravi.

Now, let's use this information to determine the correct pairing of richest and poorest individuals:

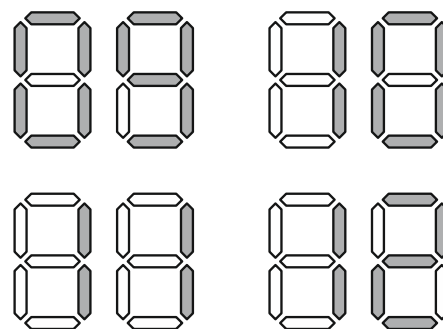
Based on the first point, we know Rahul is richer than Ravi. Therefore, Ravi is the poorest among the two.

Now, let's consider the second and third points. Since the combined wealth of Ravi and Rahul is the same as the combined wealth of Rakesh and Ramesh, and Rakesh and Rahul together have less money than Ramesh and Ravi, it's safe to conclude that Ramesh must be the richest because his wealth, when combined with Ravi's, is greater than the wealth of Rakesh and Rahul.

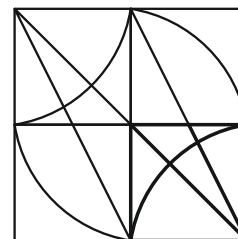
So, the correct answer is B) Ramesh is the richest, and Rakesh is the poorest.

Ramesh is the richest because his wealth, when combined with Ravi's, is greater than Rakesh and Rahul's combined wealth. And Rakesh is the poorest because the combined wealth of Rakesh and Rahul is less than that of Ramesh and Ravi.

58. (A) All the numbers are shown in the given image.



59. (D)



60. (B) Emphasizing the purity of Company A's butter might suggest an underlying assumption that competitors might not offer butter as pure.