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NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION (UPDATED)

CLASS - 8
Question Paper Code : 1P104

KEY

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

SOLUTIONS

MATHEMATICS

01. **(B)** Perimeter = AB + BC + CA

$= (2x - 4y - 3z + 5x - 6y - 10z + x + y + z)$ cm

$= (8x - 9y - 12z)$ cm

02. **(D)** $25^3 + 100^3 - 125^3 = 15625 + 1000000 - 1953125$

$= -9,37,500$

03. **(C)** $\dfrac{3}{4} + \dfrac{5}{36} + \dfrac{7}{144} + \dfrac{9}{400} + \dfrac{11}{900}$

$= \dfrac{3}{2^2} + \dfrac{5}{6^2} + \dfrac{7}{12^2} + \dfrac{9}{20^2} + \dfrac{11}{30^2}$

$= \dfrac{3}{(1\times 2)^2} + \dfrac{5}{(2\times 3)^2} + \dfrac{7}{(3\times 4)^2} + \dfrac{9}{(4\times 5)^2} + \dfrac{11}{(5\times 6)^2}$

$= \left(1 - \dfrac{1}{2^2}\right) + \left(\dfrac{1}{2^2} - \dfrac{1}{3^2}\right) + \left(\dfrac{1}{3^2} - \dfrac{1}{4^2}\right)$

$+ \left(\dfrac{1}{4^2} - \dfrac{1}{5^2}\right) + \left(\dfrac{1}{5^2} - \dfrac{1}{6^2}\right)$

$= 1 - \dfrac{1}{4} + \dfrac{1}{4} - \dfrac{1}{9} + \dfrac{1}{9} - \dfrac{1}{16} + \dfrac{1}{16} - \dfrac{1}{25}$

$+ \dfrac{1}{25} - \dfrac{1}{36} = 1 - \dfrac{1}{36} = \dfrac{36-1}{36} = \dfrac{35}{36}$

04. (C) Given $\pi r^2 h = 2425.5$ cm^3

$$\frac{22}{\cancel{7}} \times r^2 \times \cancel{7} \text{ cm} = 2425.5 \text{ cm}^3$$

$$r^2 = \frac{2425.5 \text{ cm}^3}{22 \text{ cm}}$$

$$r^2 = 110.25 \text{ cm}^2$$

$$r = \sqrt{110.25} \text{ cm}$$

$$r = 10.5 \text{ cm}$$

05. (D) $\left(\sqrt{2}x - \sqrt{3}y\right)\left(\sqrt{2}x + \sqrt{3}y\right)$

$$= \sqrt{2}x\left(\sqrt{2}x + \sqrt{3}y\right) - \sqrt{3}y\left(\sqrt{2}x + \sqrt{3}y\right)$$

$$= \left(\sqrt{2}\right)^2 x^2 + \cancel{\sqrt{2}x\sqrt{3}xy} - \cancel{\sqrt{2}x\sqrt{3}xy} - \left(\sqrt{3}\right)^2 y^2$$

$$= 2x - 3y$$

06. (A) $2^{2028} + 2^{2027} - 2^{2026} - 2^{2025} = 2^{2025} \times 2^3 + 2^{2025} \times 2^2 - 2^{2025} \times 2 - 2^{2025} \times 1$

$$= 2^{2025}(8 + 4 - 2 - 1)$$

$$= 9 \times 2^{2025}$$

$$= 3^2 \times 2^2 \times 2^{2023}$$

$$= 6^2 \times 2^{2023}$$

07. (B) $32^{21} = \left(2^5\right)^{21} = 2^{5 \times 21} = 2^{105}$

$$4^{53} = \left(2^2\right)^{53} = 2^{2 \times 53} = 2^{106}$$

$$8^{34} = \left(2^3\right)^{34} = 2^{3 \times 34} = 2^{102}$$

$$16^{26} = \left(2^4\right)^{26} = 2^{4 \times 26} = 2^{104}$$

∴ $2^{106} > 2^{105} > 2^{104} > 2^{102}$

∴ $2^{106} = 4^{53}$ is the greatest option.

08. (B) Let the no. of coins of 50 paise be 'x'

∴ Amount of 'x' coins = 50x paise

No. of coins of 25 paise = $(118 - x)$

Amount of $(118 - x)$ coins

$= (118 - x) \times 25$ paise

∴ Total amount = $[50x + (118 - x)\,25]$ paise

$= [50x + 2950 - 25x]$ paise

$= (25x + 2950)$ paise

Given $(25x + 2950)$ paise

= Rs. 41.25 = 4125 paise

$25x = 4125 - 2950$

$25x = 1175$

$$x = \frac{\cancel{1175}^{\,\cancel{235}^{47}}}{\cancel{25}_{\cancel{5}1}}$$

No. of coins of 50 paise (x) = 47

09. (C) $\dfrac{2^{x+2} - 2^x}{2^{x-1} - 2^x} = \dfrac{\left(2^x \times 2^2 - 2^x\right)}{\left(\dfrac{2^x}{2} - 2^x\right)}$

$$= \frac{\cancel{2^x}\left(2^2 - 1\right)}{\cancel{2^x}\left(\dfrac{1}{2} - 1\right)}$$

$$= \frac{(4 - 1)}{\left(\dfrac{1 - 2}{2}\right)}$$

$$= \frac{3}{\left(\dfrac{-1}{2}\right)}$$

$$= -3 \times 2$$

$$= -6$$

10. (A) Given P = Rs. 1,60,000 R = 15%

$$N = \left(2 + \frac{4}{12}\right) \text{ years}$$

$$= \left(2 + \frac{1}{3}\right) \text{ years}$$

Compound amount for 2 years

$$= p\left(1 + \frac{r}{100}\right)^n$$

$$= ₹\,1,60,000\left(1 + \frac{\cancel{15}^3}{\cancel{100}_{20}}\right)^2$$

$$= ₹\,1,60,000\left(\frac{20 + 3}{20}\right)^2$$

$= ₹ \underset{1}{\cancel{1,60,000}}^{\cancel{8000}^{400}} \times \frac{23}{\cancel{20}_1} \times \frac{23}{\cancel{20}_1}$

$= ₹ \cancel{1,60,000}^{\cancel{800}^{400}} \times \frac{23}{\cancel{20}} \times \frac{23}{\cancel{20}}$

$= ₹ \, 2,11,600$

Compound amount for next 4 months =

$p\left(1 + \dfrac{RT}{100}\right)$

$= ₹ \, 2,11,600\left(1 + \dfrac{\cancel{15}^{\cancel{5}} \times \dfrac{1}{\cancel{3}}}{\cancel{100}_{20}}\right)$

$= ₹ \, 2,11,600\left(\dfrac{20+1}{20}\right)$

$= ₹ \, \cancel{2,11,600}^{10580} \times \dfrac{21}{20}$

A = 2,22,180

Compound interest = A − P

= ₹ 2,22,180 − ₹ 1,60,000

= ₹ 62,180

11. (D) Given $2\pi rh = 2640 \text{ cm}^2$

$2 \times \dfrac{22}{7} \times r \times 30 \text{ cm} = 2640 \text{ cm}^2$

$r = \cancel{2640}^{\cancel{88}^{42}} \text{ cm}^2 \times \dfrac{1}{\cancel{2}_1} \times \dfrac{7}{\cancel{22}_1} \times \dfrac{1}{\cancel{30 \text{ cm}}_1}$

r = 14 cm

12. (C) Given side of the square = a = 10 cm.

Area of the square = $a^2 = (10 \text{ cm}^2) = 100 \text{ cm}^2$

Perimeter of the square = 4a = 4 × 10 cm

Given perimeter of the rectangle = Perimeter of the square.

$\Rightarrow$ 2(l + b) = 40 cm

$l + b = \dfrac{40 \text{ cm}}{2} = 20 \text{ cm}$

12 cm + b = 20 cm

b = 20 cm − 12 cm

b = 8 cm

Area of the rectangle = lb = 12 cm × 8 cm

= 96 cm²

Difference of areas = 100 cm² − 96 cm²
= 4 cm²

13. (A) Let the original price be ₹ x.

Cost after 3 years = $p\left(1 - \dfrac{r}{100}\right)^3$

$= ₹ \, x\left(1 - \dfrac{\cancel{10}}{\cancel{100}_{10}}\right)^3$

$= x\left(\dfrac{10-1}{10}\right)^3 = ₹ \, 58{,}320 \, [\because \text{Given}]$

$= ₹ \, x \times \dfrac{9}{10} \times \dfrac{9}{10} \times \dfrac{9}{10} = ₹ \, 58{,}320$

$x = ₹ \, \cancel{58,320}^{\cancel{6480}^{\cancel{720}^{80}}} \times \dfrac{10}{\cancel{9}_1} \times \dfrac{10}{\cancel{9}_1} \times \dfrac{10}{\cancel{9}_1}$

$\therefore$ Original value (x) = ₹ 80,000

14. (D) Let the side of square be a units

Given $l = \left(\dfrac{100+30}{100}\right)a = \dfrac{13a}{10}$

$b = \left(\dfrac{100+20}{100}\right)a = \dfrac{12a}{10}$

New area $= \dfrac{13a}{10} \times \dfrac{12a}{10} = \dfrac{156a^2}{100}$

Increased area $= \dfrac{156a^2}{100} - a^2 = \dfrac{56a^2}{100}$

Increased area percentage

$= \dfrac{\left(\dfrac{56a^2}{100}\right)}{a^2} \times 100$

= 56%

15. (A) $\left[(-1)^0 + (-1)^1 + (-1)^2 + (-1)^3 + \ldots + (-1)^{2025}\right]$

$= \left[1 - 1 + 1 - 1 + \ldots + (-1)^{2024} + (-1)^{2025}\right]$

$= \left[\cancel{1} - \cancel{1} + \cancel{1} - \cancel{1} + \ldots + \cancel{1} - \cancel{1} + \cancel{1} - \cancel{1}\right]$

$= 0$

16. (C) Given $8 \times 4^x = \dfrac{5}{512}$

$4^x = \dfrac{1}{512} \times \dfrac{1}{8} = \dfrac{1}{2^9} \times \dfrac{1}{2^3} = \dfrac{1}{2^{9+3}}$

$(2^2)^x = 2^{-12}$

$2x = -12$

$x = \dfrac{-12}{2} = -6$

$\therefore \dfrac{4.5}{x} = \dfrac{4.5}{-6} = -0.75$

17. (C) $\sqrt{2,62,144} = 512$

$\therefore \sqrt[6]{2,62,144} = \sqrt[3]{\sqrt{2,62,144}}$

$= \sqrt[3]{512}$

$= 8$

18. (A) Let the cost price of each pen be Rs. x

$\therefore$ CP of 22.5 pens = 22.5 x

Given SP of 20 pens = 22.5 x

SP of each pen $= \dfrac{₹22.5x}{20}$

$= \dfrac{₹\cancel{225}^{9}x}{\cancel{200}_{8}} = \dfrac{₹9x}{8}$

Profit = SP − CP

$= \dfrac{₹\,9x}{8} - ₹\,x = \dfrac{₹\,x}{8}$

Profit percentage $= \dfrac{\text{Profit}}{\text{CP}} \times 100$

$= \dfrac{\dfrac{x}{8}}{x} \times 100 = \dfrac{x}{8} \times \dfrac{1}{x} \times 100 = 12.5\ \%$

19. (D) Given $a = \dfrac{x^3}{8}$ cm³

$a^3 = \left(\dfrac{x}{2}\ \text{cm}\right)^3$

$a = \dfrac{x}{2}$ cm

Sum of all edges = 12 a

$= 12 \times \dfrac{x}{2}\text{cm}$

$= 6x$ cm

20. (C) Given $\sqrt[3]{x + 172} = 13$

cubing on both sides

$\left[\sqrt[3]{x + 172}\right]^3 = 13^3$

$x + 172 = 2197$

$x = 2197 - 172$

$x = 2025$

21. (C) $\sqrt{1^3 + 2^3 + 3^3 + 4^3 + 5^3 + 6^3 + 7^3}$

$= \sqrt{1 + 8 + 27 + 64 + 125 + 216 + 343}$

$= \sqrt{784}$

$= 28$

22. (A) Given $l$bh = 724.5 cm³

$l \times 7\text{ cm} \times 9\text{ cm} = 724.5$ cm³

$l = \dfrac{\cancel{724.5}^{\;80.5\;\;11.5}\ \text{cm}^3}{\cancel{7}_1 \times \cancel{9}_1\ \text{cm}^2} = 11.5$ cm

TSA of a cuboid = 2(lb + bh + hl)

= 2(11.5 × 9 + 9 × 7 + 7 × 11.5) cm²

= 2(103.5 + 63 + 80.5) cm²

= 2(247 cm²)

= 494 cm²

23. (A) Side of the first square = $(2x - 1)$ m

$\Rightarrow$ Area = $(2x - 1)^2$ m²

Side of the second square = $(5x + 4)$ m

$\Rightarrow$ Area = $(5x + 4)^2$ m²

According to the problem,

$9(2x - 1)^2 = (5x + 4)^2$

$3^2(2x - 1^2) = (5x + 4)^2$

$[3(2x - 1)]^2 = (5x + 4)^2$

$6x - 3 = \sqrt{(5x + 4)^2}$

$6x - 3 = 5x + 4$

$6x - 5x = 4 + 3$

$x = 7$ m

$5x + 4 = 5(7) + 4 = 35 + 4$

$= 39$ metres

If $x = 7$

then $2x - 1 = 2(7) - 1 = 14 - 1 = 13$ m

24. (A) 5 units difference = 15 cell phone

$$\therefore 1 \text{ unit} = \frac{\cancel{15}^{3}}{5} = 3$$

$\therefore$ No. of cell phones sold on Monday

$= 7 \times 3 = 21$

25. (C) $x^2 - x - 2 \quad = x^2 - 2x + x - 2$

$\qquad\qquad\qquad = x(x - 2) + 1(x - 2)$

$x^2 - x - 2 \quad = (x - 2)(x + 1)$

$x^2 - 2x - 3 \quad = x^2 - 3x + x - 3$

$\qquad\qquad\qquad = x(x - 3) + 1(x - 3)$

$\qquad\qquad\qquad = (x + 1)(x - 3)$

$x^2 - 5x + 6 \quad = x^2 - 3x - 2x + 6$

$\qquad\qquad\qquad = x(x - 3) - 2(x - 3)$

$\qquad\qquad\qquad = (x - 3)(x - 2)$

$$\sqrt{(x^2 - x - 2)(x^2 - 2x - 3)(x^2 - 5x + 6)}$$

$$= \sqrt{(x - 2)(x + 1)(x + 1)(x - 3)(x - 3)(x - 3)}$$

$$= \sqrt{(x + 1)^2 (x - 2)^2 (x - 3)^2}$$

$$= (x + 1)(x - 2)(x - 3)$$

$$= (x + 1)(x^2 - 5x + 6)$$

$= x^3 - 5x^2 + 6x + x^2 - 5x + 6$

$= (x^3 - 4x^2 + x + 6)$

PHYSICS

26. (B) The air particles from the floor vibrate and cause the neighbouring air particles to vibrate and pass the signal to our ears.

27. (C) Due to frictional force between the tyres and the road you need to keep on pedalling a bicycle to keep it going. If you stop pedalling, the bicycle will slow down and stop.

28. (B) Pressing a lift button and pumping air into a deflated ball involve push force. Stretching a rubber band and dragging a cart involve pull forces.

29. (C) An LED can glow even when a weak electric current flows through it.

30. (A) By expansion and contraction of ciliary muscles the eye lens controls the focus of the eye by varying its thickness. So, labelled part is P.

31. (D) Pressure of a liquid in a jar or a container is directly proportional to its depth. Liquids exert different pressures at different depths as pressure of water increases with depth i.e., water has less pressure on the upper surface, medium in the middle and highest at the bottom of the container.

32. (A) The charge in the glass rod rubbed with silk is positive (as it loses electrons).

The charge in the ebonite rod rubbed with fur is negative (as it gains electrons).

So, when these two rods are brought close to each other, they attract, since unlike charges attract each other.

33. (C) Smoothening a surface in contact beyond a certain limit increases friction and as a result, surface projections are sharpened.

34. (Delete)

35. (B) The correct matching is i-q, ii-s, iii-p, iv-r

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.

CHEMISTRY

36. (A) X is Coal, Y is Limited, Z is Always. Coal (X) is an exhaustible natural resource found in (Y) limited quantity in nature and (Z) always gets exhausted by human activities.

37. (D) If we heat the cup with water, it does not burn but the water starts boiling after some time because the heat supplied to the paper cup is transferred to water by conduction. So in the presence of water, the ignition temperature of paper is not reached. Hence, it does not burn.

38. (C) The four main varieties of coal from superior to inferior is as given below.

Anthracite - 80 % carbon

Bituminous - 60 % carbon

Lignite - 50 % carbon

Peat - 30 % - 40% carbon

39. (D) A soda acid fire extinguisher contains in (i) baking soda and in (ii) sulphuric acid in two separate compartments.

40. (D) The correct matching is

P-(ii), Q-(iii), R-(iv), S-(i)

Kerosene - Jet air craft fuel

Diesel - Generation of electricity

Paraffin wax - Ointments

Bitumen - Metalling of roads

41. (D) Statements (A) and (B) are true. Carbon dioxide is the best extinguisher for fires involving inflammable materials.

42. (B) Density of natural gas is lower than oil and water. In the oil wells, natural gas forms the top most layer followed by oil and water. Hence, natural gas and oil are lighter than water.

43. (C) Statements I, III and IV are correct. Water should not be used to extinguish fires caused by cooking oil.

44. (A) All the given actions when followed by vehicle owners help in saving petrol and diesel in vehicles except avoid too much of braking.

45. (B) Gases produced in a flame are hot due to the complete burning of a substance or a fuel. Hot gases are lighter and rise up. Due to the above reasons, a flame is always pointed upwards.

BIOLOGY

46. (D) Fermentation takes place by the release of CO_2 and alcohol.

47. (A) 1 - R; 2 - P; 3 - Q

48. (C) According to the given classification chart, X and Y are kharif crops whereas W and Z are rabi crops. Maize and Jowar are kharif crops whereas wheat and Mustard are rabi crops.

49. (A) Endangered animal is an animal on the verge of extinction if the same causative factors continue, e.g., Asiatic lion, blue whale, crocodile etc.

50. (B) The given figure shows fertilisation are fusion of male and female gametes.

51. (C) The given figure shows crop rotation.

52. (B) Plasmodium, Vibrio cholera are pathogens. Plasmodium is a protozoan that cause malaria. Vibrio Cholera is a bacteria that cause cholera.
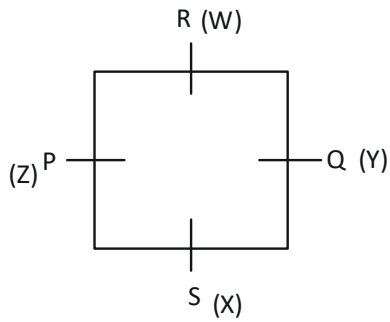
53. (D) Part 'X' is nucleus. It controls all the functions of amoeba.

54. (D) In the given paragraph X is an endemic species.

55. (A) Crop X is a leguminous crop like pea. Leguminous crop has the ability to fix atmospheric nitrogen in soluble form in soil.

CRITICAL THINKING

56. (C)

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            R (W)
         ┌───┬───┐
         │       │
    (Z) P ┤       ├ Q (Y)
         │       │
         └───┬───┘
            S (X)
```

57. (D)

(A) Irony in speech: The passage does not specifically mention irony as a cause of misunderstanding.

(B) Arrogance in speech: The passage does mention that the ordinary speech of an educated person may strike an uneducated listener as pompous, which can be interpreted as a form of arrogance. However, it is not the main focus of the passage.

(C) Verbosity in speech: The passage does not mention verbosity (excessive wordiness) as a problem.

(D) Ambiguity in speech: The passage specifically mentions that the use of an ambiguous word may create misunderstandings and turn a potential friend into an enemy.

Conclusion:

Given the passage's emphasis on the careful use of words to avoid misunderstandings, the best way to win a friend is to avoid ambiguity in speech.

58. (A) Assertion (A) : According to a government data, the population of milk cow of foreign breed has increased by 60% while that of domestic breeds has increased by only 2% in the last 7 years in India.

This statement provides specific data on the population growth of foreign breed and domestic breed milk cows in India over the past 7 years.

Reason (R) : Milk cow of foreign breed gives a much higher yield of milk.

This statement provides a potential reason why the population of foreign breed milk cows might be increasing more rapidly than domestic breeds.

The reason (R) correctly explains the phenomenon stated in the assertion (A).
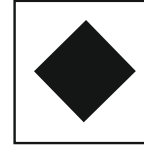
59. (B)

60. (D) N@L * A%M

1. N@L means N is the brother of L.

2. L * A means L is the mother of A.

3. A%M means A is the father of M.

Putting it together:

- N is the brother of L.

- L is the mother of A.

- A is the father of M.

In this scenario, N is the brother of L, who is the grandmother of M. This makes N the great-uncle of M, not the direct uncle.

(B) N − L + A * M

1. N − L means N is the husband of L.

2. L + A means L is the wife of A.

3. A * M means A is the mother of M.

This scenario is invalid as L cannot be both the wife and husband to different people in the given logic.

(C) N@L − A#M

1. N@L means N is the brother of L.

2. L − A means L is the husband of A.

3. A#M means A is the sister of M.

This scenario is invalid as A cannot be both the wife and sister to M.

(D) 1. N@L means N is the brother of L.

2. L − A means L is the husband of A.

3. A * M means A is the mother of M.

Putting it together:

- N is the brother of L.

- L is the husband of A.

- A is the mother of M.

Thus, L is the father of M, and N is the brother of M's father, making N the uncle of M.