



**NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION**

**CLASS - 7**  
**Question Paper Code : 1B107**

**KEY**

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

**SOLUTIONS**

**MATHEMATICS**

01. (D) 
$$\left( \frac{4.2 \times 4.2 \times 2.1}{0.7 \times 0.3 \times 10 \times 10} \right) = \frac{4.2 \times 4.2 \times 2.1}{0.7 \times 10 \times 0.3 \times 10}$$

$$= \frac{\cancel{4.2}^{0.6} \times \cancel{4.2}^{1.4} \times 2.1}{\cancel{1} \times \cancel{1}}$$

= 1.764

02. (B) Given  $4s = 800 \text{ m}$

$$s = \frac{800}{4} \text{ m}$$

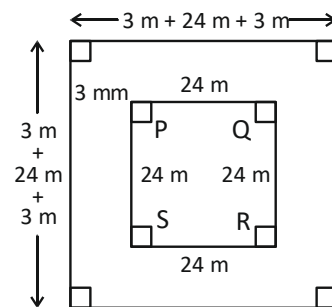
$s = 200 \text{ m}$

Area of square =  $s \times s = 200 \text{ m} \times 200 \text{ m}$

= 40,000 square meters

03. (C) Side of the outer square

$$= 3 \text{ m} + 24 \text{ m} + 3 \text{ m} = 30 \text{ m}$$



Total area = Area of the outer square =  $s \times s = 30 \text{ m} \times 30 \text{ m} = 900 \text{ m}^2$

Area of the inner square =  $s \times s = 24 \text{ m} \times 24 \text{ m} = 576 \text{ m}^2$

Area of the path = Total area – area of inner square

$$= 900 \text{ m}^2 - 576 \text{ m}^2$$

$$= 324 \text{ m}^2$$

04. (B) Option (A) :  $-125 \times 521 = -65,125$

Option (B) :  $-136 \times 515 = -70,040$

Option (C) :  $-116 \times 518 = -60,088$

Option (D) :  $-145 \times 468 = -67,860$

05. (C)  $\frac{-19}{4} = -4.75$

$$\frac{-34}{7} = -4.85$$

$$\frac{-13}{3} = -4.33$$

$$\frac{-37}{8} = -4.625$$

$$\therefore -4.85 < -4.75 < -4.625 < -4.33$$

$$\text{i.e., } \frac{-34}{7} < \frac{-19}{4} < \frac{-37}{8} < \frac{-13}{3}$$

Hence, option 'C' is in the ascending order.

06. (C) Interest for 3 years

$$= \text{Rs. } 51,200 - \text{Rs. } 41,600$$

$$= \text{Rs. } 9600$$

$$\therefore \text{Principal} = \text{Amount for 3 years} - \text{interest for 3 years}$$

$$= \text{Rs. } 41,600 - \text{Rs. } 9,600$$

$$= \text{Rs. } 32,000$$

$$I = \frac{\text{PTR}}{100}$$

$$\text{Rs. } 9600 = \frac{\text{Rs. } 32,000 \times 3 \times R}{100}$$

$$R = \frac{\text{Rs. } 9600}{\text{Rs. } 960} = 10\%$$

07. (B) Perimeter

$$= \left( \frac{7x^3}{2} - \frac{x^2}{2} + \frac{5}{3} + \frac{3x^3}{2} + \frac{7x^2}{4} - x + \frac{1}{3} + \frac{3x^2}{2} - \frac{5x}{2} - 2 \right)$$

$$= \left( \frac{7x^3}{2} + \frac{3x^3}{2} \right) + \left( -\frac{x^2}{2} + \frac{7x^2}{4} + \frac{3x^2}{2} \right)$$

$$+ \left( -x - \frac{5x}{2} \right) + \left( \frac{5}{3} + \frac{1}{3} - 2 \right)$$

$$= \left( \frac{7x^3 + 3x^3}{2} \right) + \left( \frac{-2x^2 + 7x^2 + 6x^2}{4} \right)$$

$$+ \left( \frac{-2x - 5x}{2} \right) + \left( \frac{5 + 1 - 6}{3} \right)$$

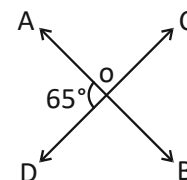
$$= \frac{10x^3}{2} + \frac{11x^2}{4} - \frac{7x}{2} + \left( \frac{0}{3} \right)$$

$$= \left( 5x^3 + \frac{11x^2}{4} - \frac{7x}{2} \right) \text{ cm}$$

08. (D) Given  $\angle AOD = 65^\circ$

$$\Rightarrow \angle BOC = \angle AOD = 65^\circ$$

[ $\therefore$  vertically opposite angles]



$$\text{But } \angle AOD + \angle DOB + \angle BOC + \angle COA = 360^\circ$$

[ $\therefore$  complete angle]

$$65^\circ + \angle DOB + 65^\circ + \angle COA = 360^\circ$$

$$\angle DOB + \angle COA + 130^\circ = 360^\circ$$

$$\angle DOB + \angle COA + 360^\circ - 130^\circ = 230^\circ$$

09. (A) Let the second expression be 'k'

$$\text{Given } \left( \frac{13x}{7} + \frac{12y}{5} + \frac{11xy}{2} \right) + k$$

$$= \frac{51xy}{14} - \frac{19x}{35} - \frac{31y}{10}$$

$$\therefore K = \left( \frac{51xy}{14} - \frac{11xy}{2} \right) + \left( \frac{-19x}{35} - \frac{13x}{7} \right)$$

$$\begin{aligned}
& + \left( \frac{-31y}{10} - \frac{12y}{5} \right) \\
& = \left( \frac{51xy - 72xy}{14} \right) + \left( \frac{-19x - 65x}{35} \right) \\
& + \left( \frac{-31y - 24y}{10} \right) \\
& = \frac{-26^{13}xy}{14_7} - \frac{84^{12}x}{35_5} - \frac{55^{11}y}{10_2}
\end{aligned}$$

10. (C) Given  $\angle AOD = 180^\circ$   
 But  $\angle AOC + \angle COD = 180^\circ$   
 [ $\because$  straight angle]  
 $115^\circ + \angle COD = 180^\circ$   
 $\angle COD = 180^\circ - 115^\circ = 65^\circ$   
 $\angle AOB + \angle BOD = 180^\circ$   
 [ $\because$  Straight angle]  
 $\angle AOB + 135^\circ = 180^\circ$   
 $\angle AOB = 180^\circ - 135^\circ = 45^\circ$   
 But  $\angle AOB + \angle BOC = 115^\circ$   
 $45^\circ + \angle BOC = 115^\circ$   
 [ $\because \angle AOB = 45^\circ$ ]  
 $\angle BOC = 115^\circ - 45^\circ$   
 $\angle BOC = 70^\circ$

11. (B)

$$\frac{(3^2)^n \times 3^2 \times \left( 3^{\frac{-n}{2} \times 2} \right) - (3^3)^n}{3^{3m} \times 3^2 \times 2^3} = 81$$

$$\Rightarrow \frac{3^{2n} \times 9 \times 3^n - 3^{3n}}{3^{3m+2} \times 8} = 81$$

$$\frac{3^{2n+n} \times 9 - 3^{3n}}{3^{3m+2} \times 8} = 81$$

$$\frac{3^{3n} \times 9 - 3^{3n}}{3^{3m+2} \times 8} = 3^4$$

$$\frac{3^{3n}(9-1)}{3^{3m+2} \times 8} = 3^4$$

$$\frac{3^{3n-3m-2} \times \cancel{8}}{\cancel{8}} = 3^4$$

$$\begin{aligned}
3^{3n-3m-2} &= 3^4 \\
\therefore 3n - 3m - 2 &= 4 \\
-2 - 4 &= 3m - 3n \\
3(m - n) &= -6 \\
m - n &= \frac{-6}{3} = -2
\end{aligned}$$

12. (A)

$$\begin{aligned}
\frac{3^{2024} + 3^{2023} + 3^{2022}}{3^{2023} + 3^{2022} - 3^{2021}} &= \frac{3^{2022} \times 3^2 + 3^{2022} + 3 + 3^{2022} \times 1}{3^{2021} \times 3^2 + 3^{2021} \times 3 - 3^{2021} \times 1} \\
&= \frac{3^{2022}(3^2 + 3 + 1)}{3^{2021}(3^2 + 3 - 1)} \\
&= 3^{2022-2021} \frac{(9+3+1)}{(9+3-1)} \\
&= 3 \times \frac{13}{11} \\
&= \frac{39}{11}
\end{aligned}$$

13. (B) A regular polygon has 'n' sides then it has 'n' line symmetries

(OR)

Number of line symmetries of a regular polygon = Number of sides of that regular polygon

14. (C) Given  $\left( \frac{x-4}{3} \right) - \left( \frac{2x+1}{6} \right) + x = \frac{-2}{3}$

$$\frac{2(x-4) - (2x+1) + 6x}{6} = \frac{-2}{3}$$

$$\cancel{2x} - 8 - \cancel{2x} - 1 + 6x = \frac{-2}{3} \times \cancel{6}^2$$

$$6x = -4 + 9$$

$$x = \frac{5}{6}$$

$$15. (D) \quad SI = \frac{\text{PTR}}{100} = \frac{1,00,000 \times \frac{146}{365} \times 8}{100}$$

$$= \text{Rs. } 3,200$$

16. (B) Given  $2x - 10^\circ + 3x + 20^\circ = 180^\circ$

$$5x + 10^\circ = 180^\circ$$

$$5x = 180^\circ - 10^\circ$$

$$x = \frac{170^\circ}{5} = 34^\circ$$

$\therefore \angle AOC = 2x - 10^\circ = 2 \times 34^\circ - 10^\circ = 68^\circ - 10^\circ = 58^\circ$

17. (C)

$$\text{LHS} = \left( \frac{8x}{5} + \frac{11y}{7} + \frac{9}{4}xy \right) + \left( \frac{-3x}{2} - \frac{9xy}{5} - \frac{5y}{3} \right)$$

$$= \frac{8x}{5} + \frac{11y}{7} + \frac{9xy}{4} - \frac{3x}{2} - \frac{9xy}{5} - \frac{5y}{3}$$

$$= \left( \frac{8x}{5} - \frac{3x}{2} \right) + \left( \frac{11y}{7} - \frac{5y}{3} \right) + \left( \frac{9xy}{4} - \frac{9xy}{5} \right)$$

$$= \left( \frac{16x - 15x}{10} \right) + \left( \frac{33y - 35y}{21} \right) + \left( \frac{45xy - 36xy}{20} \right)$$

$$= \left( \frac{x}{10} - \frac{2y}{21} + \frac{9xy}{20} \right)$$

18. (B)  $\text{LHS} = \frac{15}{2} - \left[ \frac{9}{4} \div \left\{ \frac{5}{4} - \frac{1}{2} \left( \frac{3}{2} - \frac{1}{3} - \frac{1}{6} \right) \right\} \right]$

$$= \frac{15}{2} - \left[ \frac{9}{4} \div \left\{ \frac{5}{4} - \frac{1}{2} \left( \frac{9-2-1}{6} \right) \right\} \right]$$

$$= \frac{15}{2} - \left[ \frac{9}{4} \div \left\{ \frac{5}{4} - \frac{1}{2} \times \frac{6}{6} \right\} \right]$$

$$= \frac{15}{2} - \left[ \frac{9}{4} \div \frac{3}{4} \right]$$

$$= \frac{15}{2} - \left[ \frac{9}{4} \times \frac{4}{3} \right]$$

$$= \frac{15-6}{2}$$

$$= \frac{9}{2} = 4\frac{1}{2}$$

19. (A)  $\text{LHS} = 109.876 (234 + 345 + 321 + 100)$

$$= 109.876 \times 1000$$

$$= 1,09,876$$

20. (A) Total weight of 35 students

$$= (45 \times 35) \text{ kg} = 1575 \text{ kg}$$

Mean weight of 35 students and the teacher =  $(45 + 0.5) \text{ kg} = 45.5 \text{ kg}$

Total weight of 35 students and the teacher =  $(45.5 \times 36) \text{ kg} = 1638 \text{ kg}$

Weight of the teacher =  $(1638 - 1575) \text{ kg} = 63 \text{ kg}$

Hence, the weight of the teacher is 63 kg

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

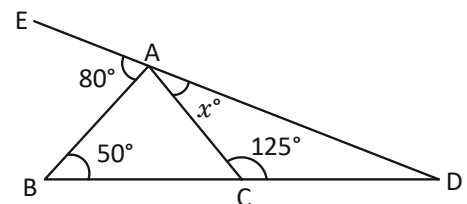
$$\therefore 3x + 20^\circ + 5x - 24^\circ = 180^\circ$$

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

$$8x = 184^\circ$$

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

22. (C) We have,  $\angle BCD = 180^\circ$



So,  $\angle ACB = 180^\circ - 125^\circ = 55^\circ$

In  $\triangle ABC$ ,  $\angle BAC = 180 - (50 + 55) = 75^\circ$

Since EAD is a straight line, we have,

$$80 + 75 + x = 180^\circ$$

$$\Rightarrow x = 25^\circ$$

23. (A) Given  $\frac{\sum x}{5} = 27$

$\Rightarrow \sum x = 27 \times 5 = 135$  and also, when one value excluded the mean gets reduced by 2.

$$\therefore \frac{\sum x}{4} = 27 - 2$$

$$\Rightarrow \frac{\sum x}{4} = 25 \Rightarrow \sum x = 25 \times 4$$

$$\Rightarrow \sum x = 100$$

$\therefore$  Excluded value =  $135 - 100 = 35$

24. (B)  $2^{20} = 2^{5 \times 4} = (2^5)^4 = 32^4$

$$3^{16} = 3^{4 \times 4} = (3^4)^4 = 81^4$$

$$4^{12} = 4^{3 \times 4} = (4^3)^4 = 64^4$$

$$5^8 = 5^{2 \times 4} = (5^2)^4 = 25^4$$

25. (A)  $\left(37\frac{3}{4}\right)^\circ + \left(48\frac{1}{2}\right)^\circ + x = 180^\circ$

$$x = 180^\circ - \left(37\frac{3}{4}\right)^\circ - \left(48\frac{1}{2}\right)^\circ = \left(93\frac{3}{4}\right)^\circ$$

### PHYSICS

26. (C) To form a battery, electric cells are connected in a straight line as shown by connecting the terminals properly.

27. (B) Only mercury thermometer uses expansion and contraction of liquid as temperature changes.

28. (C) The time taken by the pendulum from P to Q and back to P is the period of oscillation of the pendulum.

The time taken for complete oscillation is  $0.8 + 0.8 = 1.6$  seconds

So, the time taken for 20 oscillations is  $20 \times 1.6 = 32$  seconds

29. (B) Statements (ii) and (iii) are correct. There is a gap in an electric circuit when it is open and no current flows when a switch is in OFF position.

30. (B) To use a certain liquid in a thermometer, it must be in the same state (liquid) within a range of required temperatures. To measure temperature between  $-50^\circ\text{C}$  and  $50^\circ\text{C}$ , we use the one that has freezing point below  $-50^\circ\text{C}$  and boiling point above  $50^\circ\text{C}$ . i.e. alcohol. Otherwise, the liquid would freeze before it reaches  $-50^\circ\text{C}$  and it would vaporise before it reaches  $50^\circ\text{C}$ .

31. (D) The object shown is an hour glass which is used to measure time.

32. (B) The fuse material should have low melting point.

33. (B) Time taken to boil  $200 \text{ cm}^3$  of water = 8 minutes

Time taken to boil  $75 \text{ cm}^3$  of water = ?

$$\frac{75}{200} \times 8 = 3 \text{ minutes}$$

34. (B) Time period of pendulum X =  $\frac{12}{20} = 0.6$

Time period of pendulum Y =  $\frac{36}{20} = 1.8$

$\therefore$  Time period of pendulum X < Time period of pendulum Y.

35. (D) All the given statements are correct about electromagnets.

### CHEMISTRY

36. (B) Turmeric paste is yellow in colour. So, it remains yellow in acid and changes its colour to red in base.

37. (B) Iron and rust are chemically different and zinc coated iron pipes do not rust easily.

38. (A) The colourless liquid solution is an acid as it turned blue litmus paper to red.

39. (C) Part R of a ship will rust the fastest as it is nearer to the water surface.

40. (C) Suitable words to complete the given sentences is

(I) acid; (II) base; (III) organic; (IV) base

41. (A) During a chemical change both physical and chemical properties undergo a change. Interaction takes place during any change, physical or chemical.

42. (A) Dilute sodium hydroxide is a base and it reacts with dilute hydrochloric acid to form sodium chloride (salt) and water. It is a neutralization reaction.

43. (B) P – Chemical ; Q – Water ; R – Air ; S – Faster

44. (D) Farmers add slaked lime to neutralize the acidity of the soil. Persons suffering from acidity in stomach are given antacid solution like  $Mg(OH)_2$  to neutralize acidity. Ant stings are acidic. Baking soda paste is applied on ant sting.

45. (C) Saltation increases the rusting, so treatment with salt cannot be used. Other methods can be used to overcome the problem of rusting.

### BIOLOGY

46. (D) When we are exercising our muscles need more energy. To produce more energy in a process called respiration, more food and oxygen are needed. Thus, our heart pumps blood faster so that blood rich in oxygen and food can be circulated faster to the muscles. At the same time, carbon dioxide and waste produced at our muscles have to be carried away more quickly by the blood to the excretory organs.

47. (B) Plants need chlorophyll, carbon dioxide, water and light to carry out photosynthesis. Sugar and oxygen are produced during photosynthesis.

48. (B) Transfer of pollen grains to the stigma is called pollination.

49. (C) Excretion is the removal of harmful waste products of metabolic reactions and toxic materials from the body of an organism. Carbon dioxide is a metabolic waste product of aerobic respiration in all living tissues which is removed from the lungs during expiration.

50. (A) Physical digestion occurs during chewing action when the teeth cuts and grinds food into smaller pieces and mixes them with saliva. This process is known as mastication. Chemical digestion occurs when salivary amylase present in the saliva acts on starch in the food and breaks them down into maltose.

51. (D) Decomposers helps to reduce dead organic matter to minerals or as nutrients to the soil.

52. (C) Given flow chart shows the process of formation of fruit from flower. Flowers develop into fruit after pollination and fertilization.

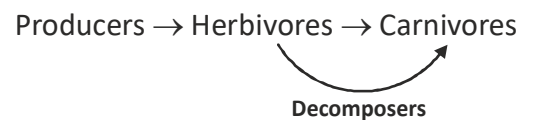
Pollination takes place before fertilization

53. (A) Trachea → bronchus → bronchiole → alveoli

54. (A) Gas  $H_2$  is oxygen gas. It is produced when plants make food during photosynthesis. It is used when living things including plants carry out respiration.

[In sunlight, plants carry out both photosynthesis and respiration, plants produce a lot of oxygen in photosynthesis but they use only part of it for respiration. The remaining oxygen is given out by plants through tiny openings called stomata found mainly on their leaves.]

55. (D) Transfer of energy flow is



**CRITICAL THINKING**

56. (D)

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57. (B)

Assertion (A) is true because cocoa solids are essential in making most chocolates (dark and milk).

Reason (R) is true because white chocolate does not contain cocoa solids.

Reason (R) does not directly explain Assertion (A) but provides an exception. Thus, it does not explain (A) correctly. The relationship is not causal but rather an exception.

58. (B)

(A) A debating club meets on the first Sunday morning of every month.

This is a structured and scheduled meeting.

It lacks the casual and spontaneous element of an informal gathering.

Not an informal gathering.

(B) After finding out about his salary raise, Jai and a few colleagues go out for a quick dinner after work.

This is a spontaneous and casual get-together.

There is no formal planning or structure.

Fits the definition of an informal gathering.

(C) Meena sends out 10 invitations for a bachelorette party she is giving for her elder sister.

This involves formal planning and sending out invitations.

It is a structured event with an organized purpose.

Not an informal gathering.

(D) Whenever she eats at a Chinese restaurant, Roop seems to run into Divya.

This is coincidental and not a planned gathering.

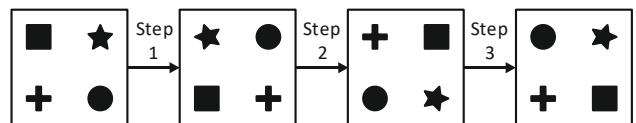
There is no element of a group of people intentionally getting together.

Not an informal gathering.

Conclusion :

The best example of an informal gathering is Option B: After finding out about his salary raise, Jai and a few colleagues go out for a quick dinner after work.

59. (C)



60. (C) When the lock said 12, the manager responded with 6.

1. When the lock said 6, the manager responded with 3.

From these examples, we can observe a pattern. Let's think about possible relationships between the numbers:

1.  $12 \rightarrow 6$

2.  $6 \rightarrow 3$

A common pattern is halving the number (dividing by 2):

- 12 divided by 2 is 6.
- 6 divided by 2 is 3.

The robber assumed this pattern and applied it to 10, which led to his answer of 5 (10 divided by 2). However, this answer triggered the alarm.

Let's consider an alternative pattern. Another possibility is looking at the number of letters in the word form of the number:

- "Twelve" has 6 letters.
- "Six" has 3 letters.

Using this pattern:

- "Ten" has 3 letters.

So, the correct response should be the number of letters in the word "ten," which is 3.

Thus, the robber should have responded with 3.

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*The End*

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