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NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION (UPDATED)

CLASS - 7

Question Paper Code : 1P214

KEY

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

SOLUTIONS

MATHEMATICS

01. (A) Let the total distance travelled be x km.

Given $\left(\frac{5x}{8}+\frac{x}{4}+15\right)$ km = x km

$\therefore x-\frac{5x}{8}-\frac{x}{4}=15$

$\frac{8x-5x-2x}{8}=15$

$\frac{x}{8}=15$

x = 15 × 8 = 120 km

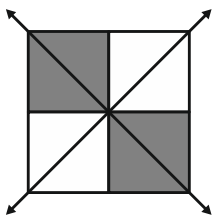
02. (B) $x^\circ + a^\circ + y^\circ + b^\circ + c^\circ + z^\circ = 180^\circ + 180^\circ + 180^\circ$

$\therefore$ $(x + y + z) + (a + b + c) = 360^\circ + 180^\circ$

$(x+y+z)+\cancel{180^\circ}=360^\circ+\cancel{180^\circ}$

$\therefore$ $x + y + z = 360^\circ = 2 \times 180^\circ = 2(a + b + c)^\circ$

03. (C)



04. (A) Area = $9 \times 1\ cm^2 + 7 \times 1\ cm^2 + 5 \times 1\ cm^2$ = $21\ cm^2$

05. (C) Given n || t

$\Rightarrow$ a + 70° = 180° $\Rightarrow \angle a = 110°$

l ||m $\Rightarrow$ b + 130° = 180 $\Rightarrow \angle b = 50°$

70° + $\angle b$ = $\angle c$

$\Rightarrow$ 70° + 50° = $\angle c$

$\angle c = 120°$

$\angle a + \angle b + \angle c = 110° + 50° + 120° = 280°$

06. (B) Required value = $1000^2 + 345^2 + 655^2 - 2 \times 1000 \times 345 + 2 \times 345 \times 655 - 2 \times 1000 \times 655$

= 1000000 + 119025 + 429025 – 690000 + 451950 – 1310000

= 0

07. (D) $\frac{-2}{3} = -0.666,\ \frac{-3}{5} = -0.6,\ \frac{-8}{11} = -0.72$

$\frac{-11}{15} = -0.73$

$\frac{-11}{15}$ is the smallest rational number.

08. (D) We have $\frac{x^3 + y^3 + z^3 - 3xyz}{x^2 + y^2 + z^2 - xy - yz - zx}$

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

$$= \frac{1 + 8 - 1 + 6}{1 + 4 + 1 - 2 + 2 + 1} = \frac{14}{7} = 2$$

09. (C) Total S.I = Rs. 275

Let x be the sum borrowed at 7% rate.

So, $\frac{(2500 - x) \times 5 \times 2}{100} + \frac{x \times 7 \times 2}{100} = 275$

$\Rightarrow x$ = Rs. 625

10. (D) The arithmetic mean (average) of 3^{10}, 3^{20} and 3^{30} is

$$\frac{3^{10} + 3^{20} + 3^{30}}{3} = \frac{3^{10}}{3} + \frac{3^{20}}{3} + \frac{3^{30}}{3}$$

$= 3^9 + 3^{19} + 3^{29}$

11. (B) $\frac{25}{19} = 1 + \frac{6}{19}$

$$= 1 + \frac{1}{\left(\frac{19}{6}\right)}$$

$$\therefore P + \frac{1}{q + \frac{1}{r}} = 1 + \frac{1}{3 + \frac{1}{6}}$$

$\therefore$ r = 6

12. (C) Area of ΔCDE = × CD × AD

= × 17.8 cm × 11.7 cm

= 104.13 cm^2

Area of the shaded region = 104.13 cm^2

(or)

Area of the rectangle – area of ΔCDE

= 17.8 × 11.7 cm^2 – 104.13 cm^2

= 208.26 cm^2 – 104.13 cm^2

= 104.13 cm^2

13. (D) Number of marbles Pankaj has = 96

Number of marbles Arun has = 63

Let the number of marbles that Arun should give Pankaj be 'x'

Then according to the problem,

(96 + x)

= 2(63 – x)

$\Rightarrow$ 96 + x = 126 – 2x

$\Rightarrow$ 3x = 126 – 96

$\Rightarrow$ 3x = 30 $\Rightarrow x$ = 10

14. (D) LHS = $a^5b - a^3b + a^2b - a^5b + 2a^3b - 2a^2b$

$- a^3b + a^2b + 2b$

$= -2a^3b + 2a^3b + 2a^2b - 2a^2b + 2b$

= 2b

15. (C) Given scale × 5 cm = 15

$1\ cm = \frac{15}{5} = 3$

$\therefore$ 6 cm = 6 × 3 = 18 cell phones

16. (D) $-44-43-42 \ldots\ldots\ldots\ldots -2-1+0+1+2 + \ldots\ldots + 42 + 43 + 44 + 45 = 45$

$\therefore$ Total digits = 88 + 1 + 1 = 90

17. (B) Const:- Extend DE up to F

$\therefore \angle DFC = \angle ABC = 80°$

In ΔCDF $80° + \angle C = 100°$

$\angle C = 20°$

18. (D) $\dfrac{3^n + 3^{n+1}}{3^{n+1} - 3^n} = \dfrac{3^n + 3^n \times 3}{3^n \times 3 - 3^n}$

$= \dfrac{3^n(1+3)}{3^n(3-1)} = \dfrac{2}{1} = 2$

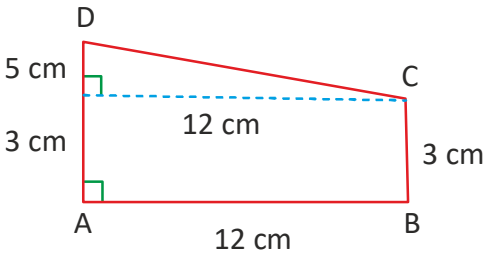
19. (C) $\dfrac{1}{2\times 2} \times \dfrac{2}{2\times 3} \times \dfrac{3}{2\times 4} \times \dfrac{4}{2\times 5} \times \dfrac{5}{2\times 6} \times \ldots\ldots\ldots \times \dfrac{30}{2\times 31} \times \dfrac{31}{64} = 2^x$

$= \dfrac{1}{2^{30}\times 2^6} = 2^x$

$= 2^{-36} = 2^x$

$\therefore x = -36$

20. (B)



Const : Draw CE // AB

$\therefore$ ABCE is a rectangle

$\therefore$ CE = AB = 12 cm

$\therefore$ AE = BC = 3 cm

$\therefore$ DE = AD – AE = 5 cm

In ΔCDE, $\angle E = 90°$

$\therefore CD^2 = DE^2 + CE^2 = 12^2 + 15^2 =$

$CD = \sqrt{169}$ cm = 13 cm

21. (A) Side of an equilateral triangle

$= \dfrac{\text{Perimeter}}{3}$

$= \dfrac{\left(3a - \dfrac{b}{9} + \dfrac{c}{81}\right)}{3}$ cm

$= \left(\dfrac{3a}{3} - \dfrac{b}{9}\times\dfrac{1}{3} + \dfrac{6}{81}\times\dfrac{1}{3}\right)$ cm

$= \left(a - \dfrac{b}{27} + \dfrac{c}{243}\right)$ cm

22. (B) Let the pricipla be 'x'

Given Amount = ₹1,28,800

But $P\left(1 + \dfrac{tr}{100}\right) = A$

$\Rightarrow P\left(1 + \dfrac{2\frac{8}{12}\times 15}{100}\right) = ₹\,1,28,800$

$\Rightarrow P\left(1 + \dfrac{\frac{8}{3}\times 15}{100}\right) = ₹\,1,28,800$

$P\left(\dfrac{20+8}{20}\right) = ₹\,1,28,800$

$P = ₹\,1,28,800 \times \dfrac{20}{28}$

= ₹ 92,000

23. (B) $\dfrac{(67.54)^2 - (32.46)^2}{474.2 - 123.4}$

$= \dfrac{(67.54 + 32.46)(67.54 - 32.46)}{350.8}$

$= \dfrac{100\times 35.084}{350.84}$

$= \dfrac{10\times \cancel{350.84}^{1}}{\cancel{350.84}_{1}}$

= 10

24. (A) Let the required rational number be a

Given $\frac{-7}{11} \times a = \frac{21}{44}$

$a = \frac{21}{44} \times \frac{-11}{7} = \frac{-3}{4}$

25. (B) $1 - 2 - 3 + 4 = 5 - 5 = 0$

$5 - 6 - 7 + 8 = 13 - 13 = 0$

$2025 - 2026 - 2027 + 2028 = -1 + 1 = 0$

$\therefore$ Total sum = 0 + 0 + 0 +.....+ 0 = 0

PHYSICS

26. (B) When batteries are connected in series, their voltages add up. So, if each battery provides 1.5V, the total voltage for the four batteries connected in series will be 1.5V + 1.5V + 1.5V + 1.5V = 6V. This means the flashlight will get a total of 6V to work, making it brighter or more powerful compared to using a single battery.

27. (A) OA shows increasing speed $\rightarrow$ constant acceleration

AB shows flat speed $\rightarrow$ acceleration = 0

28. (A) Plastic acts as a thermal insulator, reducing heat transfer to the surroundings – therefore, water in it stays hot for a longer duration.

The experiment demonstrates that different materials conduct heat at different rates. The plastic cup maintained the highest water temperature after 10 minutes, meaning it lost the least amount of heat to the surroundings. This indicates that plastic is a better thermal insulator and a poorer conductor of heat compared to steel and clay. Therefore, option (A) is the correct explanation.

29. (A,B) Uniform motion refers to an object moving at a constant speed in a straight line. In a distance-time graph, the speed is represented by the slope of the line. A constant speed requires a constant slope, which is a straight line.

30. Delete

31. (B) In an electric bulb, the metal case (3) and the base tip (4) act as external terminals through which current enters and leaves the filament. The filament ends inside are connected to these points, completing the circuit when the bulb is connected.

32. (D) The correct set of true statements is (D) (iii) and (iv) only.

(i) When K_1 is closed only

- When only key K_1 is closed, the circuit for bulb A and the parallel combination of B, C, D and E is complete.
- Current flows through the entire circuit, causing all bulbs (A, B, C, D and E) to glow.
- Statement (i) claims only bulb A glows, which is incorrect.

(ii) When K_2 is closed only

- Key K_1 is the main switch in series with the entire circuit. If K_1 is open, the circuit is broken, and no current flows.
- Statement (ii) claims bulbs B, C, D and E glow when only K_2 is closed, which is incorrect.

(iii) When both K_1 and K_2 are closed

- When both keys are closed, the circuit is complete. Bulbs B, C, D, and E are in parallel with each other. Bulb A is in series with this parallel combination.
- Current flows from the battery, through bulb A, and then splits to go through all parallel branches (B, C, D, E) before returning to the battery.
- Therefore, all bulbs (A, B, C, D and E) glow together.
- Statement (iii) is correct.

(iv) When both keys are open

- Key K_1 is in series with the battery and the entire circuit. If K_1 is open, there is a break in the main circuit path.
- No current can flow, and thus, no bulbs glow.
- Statement (iv) is correct.

33. (C) Remains unchanged

The time period Tof a simple pendulum is given by the formula : $T = 2\pi\sqrt{\frac{L}{g}}$

where :

Lis the length of the pendulum,

g is the acceleration due to gravity.

Since the mass of the bob does not appear in this equation, changing the material of the bob (e.g., from iron to wood) does not affect the time period. Therefore, the time period remains unchanged.

34. (A) In a distance-time graph, the slope represents velocity.

The initial curved section has a changing slope, indicating non-uniform acceleration (changing velocity).

The middle straight, horizontal section has a constant, non-zero slope, indicating a constant velocity (zero acceleration, or stopped accelerating).

The final curved section again has a changing slope, indicating acceleration.

35. (C) The experiment demonstrates that heat is transferred along the copper rod. As one end of the rod is heated, the heat travels through the material. When the heat reaches a point where a wax drop is fixed, it melts the wax, causing the drop to fall off. The drops fall sequentially, starting from the end closest to the flame and moving towards the other end, showing the progressive movement of heat through the solid material by the process of conduction.

CHEMISTRY

36. (C) Among the given non-metals, phosphorus is very reactive and catches fire on exposure to air.

37. (D) Ascorbic acid

Explanation: Amla (Indian gooseberry) is rich in ascorbic acid, also known as vitamin C.

It is a strong antioxidant and supports the immune system.

Ascorbic acid is also important for healthy skin and tissue repair.

38. (A) An electrical conductor conducts electricity.

39. (D) Curd, vinegar

Curd contains lactic acid and vinegar contains acetic acid.

Both are weak acids commonly found in food items.

Soap and milk of magnesia are basic, not acidic.

Hence, this set contains substances with true acidic properties.

40. (B) basic

Metal combine with oxygen to form oxides that are generally basic in nature.

41. (B) Yellow in acid and red in base

Turmeric is a natural indicator. It remains yellow in acidic solution and turns red in basic solution. So, it helps distinguish between acids and bases.

42. (C) Gloves used by electricians are made up of rubber, because it is an insulator.

43. (D) All of the given substances are derived from natural sources and show color changes with acids and bases:

(A) Litmus – Extracted from lichens; turns red in acid, blue in base.

(B) Turmeric – Turns yellow in acid, red in base.

(C) China rose (Hibiscus) – Gives magenta in acid, green in base.

44. (A) air and water

Rusting of iron is an oxidation process that occurs in the presence of both air (oxygen) and moisture (water).

45. (D) Neutralisation reaction occurs when an acid reacts with a base, forming salt and water.

BIOLOGY

46. (A) Nitrogen deficiency causes chlorosis, making leaves pale yellow, as chlorophyll production – essential for photosynthesis – requires nitrogen.

47. (B) Inserting a drought-tolerance gene helps the plant withstand water scarcity, improving survival and yield in arid environments.

48. (B) Using soap excessively or harshly can disturb natural pH and flora, potentially causing irritation or infections; it does not guarantee "complete" protection.

49. (A) Adolescence is a key developmental stage; smoking damages developing organs, causes addiction, and leads to long-term health issues.

50. (A) These organs work as a system: Pancreas releases enzymes, liver produces bile, and small intestine digests and absorbs nutrients.

51. (A) Organisms like fungi and some bacteria secrete digestive enzymes externally to break down food outside their bodies, then absorb simple nutrients.

52. (A) In autumn, reduced daylight and temperature cause chlorophyll to degrade, unmasking other pigments (carotenoids give yellow/orange; anthocyanins give red/purple).

53. (A) In adolescence, oil glands are more active, leading to sweat and acne; gentle cleansing helps manage oil and bacteria without irritating skin.

54. (A) Stomata on leaf undersides allow CO_2 entry and O_2/water vapor exit; blocking them with jelly restricts gas exchange, slowing photosynthesis and growth.

55. (B) Iodine test turns blue-black only where starch is present; green patches contain chlorophyll, enabling photosynthesis in sunlight, while non-green patches and dark conditions show no starch production.

CRITICAL THINKING

56. (B) Wood dries faster when more air can flow around it.

In stack 2, the logs are placed with more gaps between them.

These gaps let air and sunlight reach more surfaces of the logs.

In stack 1, logs are packed more tightly, so less air flows.

So, stack 2 will dry faster.

57. (C) Q touches everyone, so Q is in the middle.

P's neighbours are only T and V.

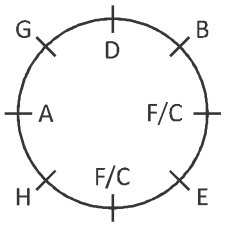
V does not touch T, U, or R.

R and S touch U.

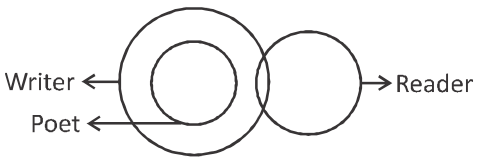
Since P already touches T and V, P cannot touch U.

So, "P and U share a wall" is incorrect.

58. (A) Considering the given statements, we come to the conclusion that the order would be A, G, D, B, [F/C] , E, [C/F], H in the clockwise direction. G, B ,E ,H are facing away from the centre and are in orange chairs, whereas A, D, C ,F are facing the centre. Therefore Option A is the correct answer. Please refer given image.



59. (C)



All Poets are writer and some Reader are writer.

60. (C) The main shape is step-like with one part taller (2 blocks high) and a long flat base. Only the blocks in option (C) fit this shape and height. Other options don't match.