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NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION

CLASS - 7

Question Paper Code : UN497

KEY

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

SOLUTIONS

MATHEMATICS

01. (D) $\frac{4}{9} \div x = \frac{-5}{6}$

$\therefore \quad \frac{4}{9} \times \frac{1}{x} = \frac{-5}{6}$

$\frac{4}{9} \times \frac{-6}{5} = x$

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

02. (C) $\angle PQS = 180° - 120° = 60°$

$\angle PST = \angle P + \angle PQS = 40° + 60° = 100°$

But $\angle PST = 30° + x$

$\Rightarrow 100° = 30° + x$

$\therefore \quad x = 70°$

03. (C) Given $3x + y = -2(x - 3y)$

$= -2x + 6y$

$3x + 2x = 6y - y$

$5x = 5y$

$x = y$

$\therefore \frac{x+3y}{3x+y} = \frac{x+3x}{3x+x} = \frac{4x}{4x} = 1$

04. (B) Given $x + x + 1 + x + 2 = 186$

$3x + 3 = 186$

$3x = 183$

$x = 61$

$\therefore$ $x + 1 = 62$ & $x + 2 = 63$

05. (D) $\frac{12xy}{(?)} = 4y \Rightarrow = \frac{12xy}{4y}$

$= 3x$

06. (C) Total tea after combining both bags

$= \left(3\frac{3}{4} + 24\frac{1}{4}\right)$ kg

$= \left(\frac{15}{4} + \frac{97}{4}\right)$ kg

$= \frac{112}{4}$ kg

= 28 kg

Amount of tea in 40 bags = 28 kg

$\therefore$ Amount of tea in 1 bag = $\left(\frac{28}{40}\right)$ kg

= 0.7 kg

$= \frac{7}{10}$ kg

07. (D) In option (A), third angle

= 180° – (45° + 45°)

= 90° (Right angle)

In option (B), third angle

= 180° – (35° + 45°)

= 180° – 80°

In option (C), third angle

= 180° – (30° + 40°)

= 110° (obtuse angle)

In option (D), third angle

= 180° – (25° + 75°)

= 80° (Acute angle)

In (D), all angles are acute. So it's a acute angled triangle.

08. (B) Ratio of areas of P & Q is 4 : 9.

Area of P = 144 sq cm

Area of Q = x sq cm (Suppose)

$\therefore$ 4 : 9 : : 144 : x

$\Rightarrow$ x = 324 sq cm

$\Rightarrow$ Side of Q = 18 cm

[Since 324 = 18 × 18]

$\therefore$ Perimeter of Q = 18 × 4 cm = 72 cm

09. (A) Consider four consecutive multiples of 8 – 16, 24, 32 and 40.

Then a = 16, b = 24, c = 32 and d = 40.

$\therefore$ $(a - c)(d - b) = (16 - 32)(40 - 24)$

$= (-16)(16)$

$= (-256)$

10. (B) Let the number be 100.

25% increase in 100 is 125.

20% decrease in 125 is

$= \left(\frac{100 - 20}{100}\right) \times 125$

$= \frac{80}{100} \times 125 = 100$ which is the resultant number.

The resultant number (100) is 100% of the original number (100).

11. (B) LHS = 0.390625 + 0.46875 + 0.140625

= 1

12. (A) $x^{2024} = (x^2)^{1.012}$

$= (-1)^{1012}$

$= 1$

13. (A) $9^{4.5} : 3^7 = (3^2)^{4.5} : 3^7$

$= 3^9 : 3^7 \quad = 3^2 : 1 \quad = 9 : 1$

14. (D) Let $\angle ABD = \angle CAD = x$ &

$\angle BAD = \angle ACD = y$

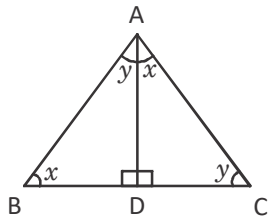
In ΔABD

$\angle B + \angle BAD + \angle D = 180°$

$x + y + 90° = 180°$

$x + y = 90°$

But $\angle BAC = x + y = 90°$



15. (B) $AB = \frac{AC}{2} = 8$ cm

$\therefore$ AE = AB = 8 cm

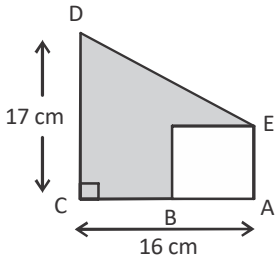
Area of shaded region = Area of trapezium ACDE – Area of square ABFE

$= \frac{1}{2} \times 16\ (17 + 8)\ cm^2 - (8\ cm)^2$

$= 8 \times 25\ cm^2 - 64\ cm^2$

$= (200 - 64)\ cm^2$

$= 136\ cm^2$



16. (B) (i) $1^5 = 1$ (ii) $0^5 = 0$

(iii) $5^0 = 1$ (iv) $5^1 = 5$

from the above $1^5 = 5^0 = 1$

Hence (i) and (iii) are equal.

17. (A) Let fourth proportion be 'x'

$\therefore$ $\frac{13}{3}, \frac{39}{4}, \frac{17}{2}, x$ are in proportion

$\frac{13x}{3} = \frac{39}{4} \times \frac{17}{2}$

$x = \frac{39}{4} \times \frac{17}{2} \times \frac{3}{13} = \frac{153}{8}$

18. (A) A scalene triangle has no line of symmetry

19. (A) A, B, C, D and E are collinear points

20. (A) $\angle D = \angle BCD = \angle ABC = 5x$

From the given options,

only for x = 30°, $\angle ABC$ satisfies.

21. (A) $\left(\frac{1}{2} - \frac{3}{4}\right) = \frac{2-3}{4} = \frac{-1}{4}$

$\frac{1}{4} + \frac{3}{8} + \frac{9}{16} = \frac{4+6+9}{16} = \frac{19}{16}$

$\left(\frac{1}{2} - \frac{3}{4}\right)\left(\frac{1}{4} + \frac{3}{8} + \frac{9}{16}\right) = \frac{-1}{4} \times \frac{19}{16} = \frac{-19}{64}$

22. (C) In a pentagon ABCDE sum of interior angles = sum of interior angles of a quadrilateral ABCD + sum of interior angles of a ΔADE

= 360° + 180° = 540°

23. (C) Area of shaded region

$= \frac{1}{2} \times 13 \times 13\ cm^2 - \frac{1}{2} \times 12\ cm \times 12\ cm$

$= \frac{1}{2}\ [169 - 144]\ cm^2$

$= \frac{1}{2} \times 25\ cm^2$

$= 12.5\ cm^2$

24. (C) Given l : b = 3 : 2 = $3x$: $2x$

Given $l \times b$ = 3,750 sq m

$3x \times 2x$ = 3,750 sq m

$6x^2$ = 3750 sq m

$x^2 = \frac{3750}{6}$ sq m

= 625 sq m

$x^2 = (25\ m)^2$

$\therefore$ x = 25 m

$\therefore$ Perimeter = $2(l + b)$

$= 2\ (3x + 2x)$

$= 2 \times 5x$

$= 10 \times 25$ m

= 250 m

Total cost for fencing = 250 × ₹ 24.76

= ₹ 6190

25. (C) $\overline{AO} \cong \overline{BO}$

PHYSICS

26. (C) Statements (i) and (ii) are correct. Component R is a bulb which consists of tungsten filament.

27. (D) The average speed of a motorist on a journey is the total distance travelled divided by the total time taken for the journey. The other options are incorrect.

28. (A) When the end M of a metal rod given in the figure is heated, the drop w placed at 5cm takes 2 minutes to fall off. Hence, for a drop at 10 cm to fall off, it takes 2 × 2 minutes = 4 minutes. Thus, the time taken by drops x, y, z are 4 minutes, 6 minutes and 10 minutes respectively.

29. (D) A student while conducting an experiment to prove the suitability of a material for making a heating coil has retained the length of the wire, number of batteries and number of bulbs constant in the circuit. She carried out the experiments by changing the material (coil) made up of different metal wires.

30. (C) 50 km/h means the bicycle travels 50 km in 1 hour.

For the first 2 hours, the distance travelled is $50 \times 2 = 100$ km.

For the remaining journey, the time taken is $\frac{30}{60} = 0.5$ hour.

The total distance travelled is 100 + 30 = 130 km, and the total time taken is 2 + 0.5 = 2.5 hours.

The average speed of the bicycle is $\frac{130}{2.5}$ = 52 km/h.

31. (C) As student Y covered the glass and wrapped the glass with a cold towel, heat from the surroundings cannot flow into the glass. The ice cubes in the glass will not gain heat quickly and will take a longer time to melt.

32. (A) Soft iron does not retain magnetism when current is switched off. So, it is the most suitable metal to use it as the core of an electromagnet. It can be used in an electric bell.

33. (A) If an object moves with a constant speed, the distance-time graph is a straight line.

34. (C) The more the bunsen burners are used, more will be the amount of heat produced. Hence, less time will be taken by ice cubes to melt.

35. (D) When 3 bulbs are already connected in an electric circuit with two cells, and a fourth bulb is also connected in the same way, their brightness decreases when the bulbs are connected in a straight line. The voltage also decreases as two cells have a voltage of 1.5 V + 1.5 V = 3 V. This 3 V is divided / distributed among the four bulbs. Each bulb will receive 3V ÷ 4 = 0.75 V instead of 1 V that was earlier shared by three bulbs.

CHEMISTRY

36. (C) Whenever the strong wind blows over tinned or straw roofs, the roofs are blown away. The reason for this is that the air pressure of the moving air over the roof decreases whereas the air pressure inside the house under the roof remains high as the air filling the house below the roof is calm (not in motion). Air from a zone of higher pressure gushes towards the zone of lower air pressure and causes the roof to lift up.

37. (B) Sodium chloride is a neutral salt that dissolves to form a neutral salt solution. The concentration of hydrogen ions in aq. HCl remained constant. Hence, the pH is not affected.

38. (D) When liquid milk changes to curd it becomes a semi-solid. The taste of milk changes and the change is irreversible as we cannot get back milk after curd is formed.

39. (D) Aqueous solution of HCl (hydrochloric acid) produces hydrogen ions when dissolved in water.

40. (B) The conversion of liquid kerosene to vapour is only a change in state, it is a physical change. Burning of kerosene is a chemical change as kerosene on burning produces CO_2 and water vapour as byproducts.

41. (C) Sulphur trioxide, SO_3 on hydrolysis gives H_2SO_4 which is a strong acid. $SO_3 + H_2O \rightarrow H_2SO_4$

42. (A) A concentrated sugar solution on cooling formed different shaped sugar crystals by the process of crystallisation.

43. (C) Toothpaste, milk of magnesia and shower cream are bases. They dissolve in water and turn red litmus paper to blue.

44. (A) Switching on a water filter and magnetising a piece of iron do not undergo change in composition. So, this two are the examples of physical changes.

45. (B) A paper strip held between one's thumb and forefinger moves upward on blowing air over it because air pressure decreases. The air pressure below the paper strip increases and moves upward when air is blown over it.

BIOLOGY

46. (A) Mucor are microorganisms. They show saprophytic mode of nutrition. These kind of bacteria feed on dead and decaying organic matter for their food.

47. (B) The organism X is frog and aerobic respiration in it may take place through skin, lungs or pharynx. Therefore, Y is cutaneous.

48. (B) The insectivorous plants are green in colour and synthesie their own food using the process of photosynthesis. But they feed on insects to get their nitrogen nutrition. Insectivorous plants grow in those soils which do not contain sufficient nitrogen mineral.

49. (B) a - 3; b - 1; c - 2; d - 5; e - 4

Erythrocytes - Red blood cells

Blood plasma - Pale yellow

Serum - Plasma without clotting factors

Spleen - Graveyard of RBC's

Leucotyes - White blood cells

50. (B) The insectivorous plant show movement of leaves to seek and capture food.

51. (C) X represents male parts of the flower i.e., stamen, Y represent female parts of the flower i.e., pistil.

52. (D) (a) Process of exhalation during respiration is being tested in the activity.

(b) The lime water in test tube turns milky because CO_2 is present in the exhaled air. It mixes with lime water in test tube and turns it milky.

53. (C) Lining of stomach wall secretes HCl.

54. (C) Specialized roots that respire are seen in mangroves.

55. (C) The pigment present in red blood cells of the blood that helps to transport oxygen is haemoglobin.

CRITICAL THINKING

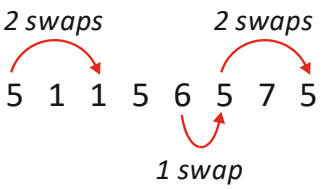
56. (C) Honesty is the best policy. Confessing to your neighbour about the accident and offering to help pay for a replacement is the responsible and ethical thing to do.

57. (B) It requires more force to move the 30 pounds, because the force is applied to a point closer to the fulcrum.

Using the force further would necessitate less force to achieve the same amount of work.

While both levers must push the same weight, the second will have a harder job because it is much closer from the point of force to the fulcrum.

58. (D) 

59. (C) 

60. (D) The given statement clearly implies that all irregular and some regular students fail in the examinations. This, in turn, means that all successful students are regular but not all regular students are successful. So, neither I nor II follows.

The End