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NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION

CLASS - 7

Question Paper Code : UN484

KEY

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

SOLUTIONS

MATHEMATICS

01. (B) $$\frac{(2.697-0.498)^2+(2.697+0.498)^2}{2.697\times2.697+0.498\times0.498}$$

$$= \frac{4.835601+10.208025}{7.521813}$$

$$= 2$$

02. (D) $3^{25} + 3^{26} + 3^{27} + 3^{28}$

$= 3^{25}(1 + 3 + 3^2 + 3^3)$

$= 3^{25} \times 40$

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

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

$\therefore$ 30 is a factor of $(3^{25} + 3^{26} + 3^{27} + 3^{28})$

03. (B) $$\left(\frac{a-3}{c-5}\right)\left(\frac{b-4}{3-a}\right)\left(\frac{c-5}{4-b}\right)$$

$$= \frac{a-3}{c-5}\times\frac{b-4}{-(a-3)}\times\frac{c-5}{-(b-4)}$$

$$= 1$$

04. (B) $$\left(a^{\frac{1}{3}}-b^{\frac{1}{3}}\right)\left(a^{\frac{2}{3}}+a^{\frac{1}{3}}b^{\frac{1}{3}}+b^{\frac{2}{3}}\right)$$

$$= \begin{pmatrix} a^{\frac{1}{3}}\times a^{\frac{2}{3}}+a^{\frac{1}{3}}\times a^{\frac{1}{3}}\times b^{\frac{1}{3}}+a^{\frac{1}{3}}b^{\frac{2}{3}}-a^{\frac{2}{3}}b^{\frac{1}{3}} \\ -a^{\frac{1}{3}}b^{\frac{1}{3}}\times b^{\frac{2}{3}}-b^{\frac{2}{3}}\times b^{\frac{1}{3}} \end{pmatrix}$$

$= a^{\frac{1+2}{3}} + a^{\frac{2}{3}}b^{\frac{1}{3}} + a^{\frac{1}{3}}b^{\frac{2}{3}} - a^{\frac{2}{3}}b^{\frac{1}{3}} - a^{\frac{1}{3}}b^{\frac{1}{3}} - b^{\frac{2+1}{3}}$

$= (a - b)$

05. (C) $17\frac{4}{13} \times \frac{8}{15} \times 17\frac{5}{33} = \frac{225}{15} \times \frac{145}{15} \times \frac{566}{33}$

$= -2830$

06. (A) Given the temperature at 12 noon is 10 °C

The temperature decreases at the rate of 2 °C per hour until mid night

From 12 noon to 9 p.m. it is 9 hours

$\Rightarrow$ Temperature decrease

$= 9 \times (-2°C) = -18°C$

$\therefore$ Temperature at 9 p.m

$= 10\ °C + (-18\ °C) = -8°C$

07. (A) $8\frac{5}{6} - \left[3\frac{3}{8} - \left\{1\frac{7}{12} - \left(11\frac{1}{24} - 4\right)\right\}\right]$

$= \frac{53}{6} - \left[\frac{27}{8} - \left\{\frac{19}{12} - \left(\frac{265}{24} - 4\right)\right\}\right]$

$= \frac{53}{6} - \left[\frac{27}{8} - \left\{\frac{19}{12} - \frac{169}{24}\right\}\right]$

$= \frac{53}{6} - \left[\frac{27}{8} - \left\{\frac{38-169}{24}\right\}\right]$

$= \frac{53}{6} - \left[\frac{27}{8} - \left\{\frac{-131}{24}\right\}\right]$

$= \frac{53}{6} - \left[\frac{27}{8} + \frac{131}{24}\right]$

$= \frac{53}{6} - \left[\frac{81+131}{24}\right]$

$= \frac{53}{6} - \frac{212}{24} = \frac{212-212}{24}$

$= 0$

08. (D) Sum of first 10 odd natural numbers = 1 + 3 + 5 + 7 + 9 + 11 + 13 +15 + 17 + 19

$= (1 + 19) + (3 + 17) + (5 + 15) + (7 + 13) + (9 + 11)$

$= 20 + 20 + 20 + 20 + 20$

$= 100$

$\therefore$ Mean $= \frac{\text{Sum of the observations}}{\text{no. of observations}}$

$= \frac{100}{10} = 10$

09. (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, $(96 + x) = 2(63 - x)$

$\Rightarrow$ $96 + x = 126 - 2x$

$\Rightarrow$ $3x = 126 - 96$

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

10. (D) Given AD||CD, $\angle CDB = \angle ADE = 47°$

Given CE||EB

$\angle CDB + \angle ECD = 180°$

$47° + \angle ECD = 180°$

$\angle ECD = 180° - 47° = 133°$

11. (B) The first 10 prime numbers are 2, 3, 5, 7, 11, 13, 17, 19, 23, 29.

Mean

$= \frac{2+3+5+7+11+13+17+19+23+29}{10}$

$= \frac{129}{10}$

$= 12.9$

12. (D) $\left(x^3 + \frac{1}{x^3}\right)\left(x^3 - \frac{1}{x^3}\right) = x^3\left(x^3 - \frac{1}{x^3}\right) + \frac{1}{x^3}\left(x^3 - \frac{1}{x^3}\right)$

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

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

13. (A) Area of square = S^2

= $(0.5x - y)^2$ Square units

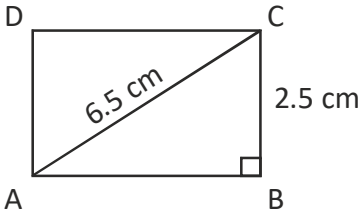
= $(0.5x - y)(0.5x - y)$

= $0.5x(0.5x - y) - y(0.5x - y)$

= $0.25x^2 - 0.5xy - 0.5xy + y^2$

= $(0.25x^2 - xy + y^2)$ Square units

14. (B) Given b = 2.5 cm and d = 6.5 cm



According to Pythagorus theorem

$AC^2 = AB^2 + BC^2$

$6.5^2 = AB^2 + (2.5)^2$

$42.25 = AB^2 + 6.25$

$AB^2 = 42.25 - 6.25$

$AB^2 = 36$

$AB^2 = 6^2$

$\therefore$ AB = 6cm

$\therefore$ Area = AB × BC = 6cm × 2.5 cm

= 15.0 cm^2

15. (A) 6p + 4q – r + 3 + 2r – 5p – 6 + 11q – 7p + 2r –1 + 2q – 3r + 4

= 6p – 5p – 7p + 4q + 11q + 2q – r + 2r + 2r – 3r + 3 – 6 – 1 + 4

= –6p + 17q + 4r – 4r + 7 – 7

= –6p + 17q

16. (B) We have,

$$\left(\frac{7}{2} - \frac{x}{3} - \frac{x^2}{5}\right) - \left(\frac{9}{2} + \frac{x}{2} + \frac{3}{5}x^2 + \frac{7}{4}x^3\right)$$

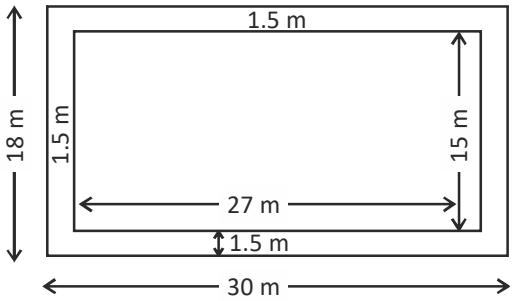
$$= \frac{7}{2} - \frac{x}{3} - \frac{x^2}{5} - \frac{9}{2} - \frac{x}{2} - \frac{3}{5}x^2 - \frac{7}{4}x^3$$

$$= \frac{7}{2} - \frac{9}{2} - \frac{x}{3} - \frac{x}{2} - \frac{x^2}{5} - \frac{3}{5}x^2 - \frac{7}{4}x^3$$

$$= \left(\frac{7-9}{2}\right) + \left(-\frac{1}{3} - \frac{1}{2}\right)x + \left(-\frac{1}{5} - \frac{3}{5}\right)x^2 - \frac{7}{4}x^3$$

$$= -1 - \frac{5}{6}x - \frac{4}{5}x^2 - \frac{7}{4}x^3$$

17. (B) Since the path runs inside this plot, the measurements of the inner rectangle are (30) – (2) (1.5) and (18) – (2)(1.5) metres



that is 27 and 15 metres.

The Area of the given rectangle = 30 × 18 = 540 square metres.

The area of the inner rectangle = 27 × 15 = 405 square metres.

Hence the area of the path = 540 – 405

= 135 square metres

The Cost of levelling the path at the rate of ₹ 117 per square metre

= ₹ 135 × ₹ 117

= ₹ 15,795

18. (A) Let Rishitha's present age be x years

$\therefore$ Her mother's present age = $4x$ years

Given $4x + 5 = 3(x + 5)$

$4x + 5 = 3x + 15$

$4x - 3x = 15 - 5$

$x = 10$

19. (B) $\frac{5^{3x+1}}{25} = 3125$

$5^{3x+1-2} = 5^5$

$5^{3x-1} = 5^5$

$3x - 1 = 5$

$3x = 5 + 1$

$x = \frac{6}{3} = 2$

20. (A) $\frac{999997}{999999} = \frac{999999-2}{999999}$

$\Rightarrow \frac{999997}{999999} = \frac{999999-2}{999999} = 1 - \frac{2}{999999}$

Similarly $\frac{777775}{777777} = 1 - \frac{2}{777777}$,

$\frac{333331}{333333} = 1 - \frac{2}{333333}$,

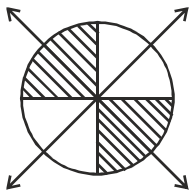
$\frac{111109}{111111} = 1 - \frac{2}{111111}$

$\frac{2}{999999} < \frac{2}{777777} < \frac{2}{333333} < \frac{2}{111111}$

$\therefore$ Smallest fraction subtracted from 1 then the result is greatest.

$\therefore$ $\frac{999997}{999999}$ is the greatest

21. (C) It has two lines of symmetry



22. (C) Given P : Q = $\frac{3}{5} : \frac{5}{7} = \frac{3}{5} \times 35 : \frac{5}{7} \times 35$

= 21 : 25

Q : R = $\frac{3}{4} : \frac{2}{5} = \frac{3}{4} \times 20 : \frac{2}{5} \times 20 = 15 : 8$

LCM of Q's ratio 25 & 15 = 75

$\therefore$ P : Q = 21 : 25 = 21 × 3 : 25 × 3 = 63 : 75

Q : R = 15 : 8 = 15 × 5 : 8 × 5 = 75 : 40

$\therefore$ P : Q : R = 63 : 75 : 40

$\therefore$ P : R = 63 : 40

23. (A) Given SI = $\frac{PJR}{100}$

$₹ \frac{\cancel{2400}^{2} \times \frac{8}{\cancel{12}_{1}} \times R}{\cancel{100}_{1}} = ₹ \frac{\cancel{960}^{8} \times \frac{18}{\cancel{12}_{1}} \times \cancel{10}}{\cancel{100}_{1}}$

$\therefore R = \cancel{8} \times \cancel{8}^{9} \times \frac{1}{\cancel{2}} \times \frac{1}{\cancel{8}}$

= 9%

24. (D) In a triangle is one side is produced so that the exterior angle formed is equal to sum of the interior opposite angles.

$\frac{9x}{5} + \frac{7x}{4} = \frac{17x}{5} + 6°$

$\frac{9x}{5} + \frac{7x}{4} - \frac{17x}{5} = 6°$

$\frac{36x + 35x - 68x}{20} = 6°$

$3x = 6° \times 20$

$x = \frac{6° \times 20°}{3} = 40°$

25. (A) Given $\overline{AB} = \overline{XY}$, $\overline{BC} = \overline{XZ}$

Hence LHS common vertex is 'B' & RHS common vertex is $\angle X$

$\therefore \angle B = \angle X$

[$\because$ corresponding parts of congruent triangles]

PHYSICS

26. (D) As the compasses near P and Q are showing opposite deflections, opposite currents are passing through them. As the compass situated away from Q is also showing deflection similar to the compass near Q the current through Q is having higher magnitude.

27. (A) The darker the colour, the better the emission through radiation. Black colour is a best emitter of heat. Hence, hot water in black container will drop at the fastest rate.

28. (C) Time taken to move from one extreme to the other extreme by the bob of a pendulum.

$$\frac{T}{2} = 0.8,\ T = 1.6\ s$$

$$f = \frac{1}{T} = \frac{1}{1.6},\quad f = 0.625\ Hz$$

29. (A) I-v heat; II-iii Element; III-vi melt; IV-vii Tungsten; V-viii CFL

30. (A) Distance-time graph plotted by both the students for motion of a car is true for tables X and Y. Both the tables X and Y represent uniform motion of a car. The graph is a straight line as the slope is same for both the tables X and Y respectively.

31. (B) Using the relation,

$$\frac{C}{5} = \frac{F-32}{9}$$

C = x °C, then F = 3 x °F

$$\frac{x}{5} = \frac{3x-32}{9}$$

$9x = 15x - 160 = 160$

$$x = \frac{160}{6} = 26.67\ °C$$

32. (A) Nichrome (an alloy of nickel and chromium is used as a heating element in electric heater because it has high resistance and high melting point.

33. (C) Statements (A), (B) and (D) are not correct. Clocks P and Q both have minute hands, so time interval of 5 minutes can be measured by both of them.

34. (C) Rod W took the longest time to reach a temperature of 60 °C. Hence, it is the poorest conductor of heat.

35. (D) When the key of an electric bell is closed, the coil inside it behaves like an electromagnet when the current passes through it. Then the armature gets attracted towards the coil and the clapper strikes the gong that produces sound.

CHEMISTRY

36. (D) All the given statements are correct.

37. (B) Given below are the correct sequence of given reactions:

(S) $S + O_2 \rightarrow SO_2$

(P) $2SO_2 + O_2 \rightarrow 2SO_3$

(R) $SO_3 + H_2O \rightarrow H_2SO_4$

(Q) $H_2SO_4 + 2KOH \rightarrow K_2SO_4 + 2H_2O$

38. (A) When iron turnings are heated with sulphur powder, a new substance called Iron sulphide is formed. Properties of which are quite different from the original one.

39. (B) The products formed due to neutralisation reaction between calcium hydroxide and hydrochloric acid are calcium chloride and water as given below.

$Ca(OH)_2 + 2HCl \rightarrow CaCl_2 + 2H_2O$

40. (B) Rusting is a P (slow) process. It occurs in the presence of Q (water) and R (air). Rusting of iron takes place faster (S) in the presence of sea water.

41. (D) All the given statements are true.

42. (A) Two colour changes of given samples 1 and 4 are correct. Sugar solution being neutral has no effect over acidic or basic solutions.

Washing soda solution turns red litmus blue but has no effect on blue litmus.

43. (C) Saltation increases the process of rusting, so treatment of iron articles with salts cannot be used to overcome the problem. Others can be used.

44. (A) Increase in temperature of the air causes an increase in the air pressure and the decrease in temperature of the air causes a decrease in the air pressure. So, temperature has direct effect on air pressure. Container P has lowest air pressure as the temperature of air is less when compared with air in containers Q, R and S respectively.

45. (C) Group 1 : Tartaric acid, oxalic acid and ascorbic acid are organic acids while nitric acid is a mineral acid.

Group 2 : Carbonic acid is a weak acid while others are strong acids.

Group 3 : Zinc hydroxide is a weak base while others are strong bases.

Group 4 : Lemon juice is acidic in nature while others are neutral solutions.

BIOLOGY

46. (A) Given parts grow into new plants.

47. (B) X is ovary. Fertilisation takes place at X. Y is stigma. Pollination takes place at Y.

48. (C) Girdling causes the removal of phloem. It results in the obstruction of movement of food travelling down the stem.

49. (C) (ii), (i), (v), (iv), (iii)

50. (A) Seeds dispersed by animals - Xanthium, guava and apple.

51. (C) Exhaled air contains more carbon dioxide. Therefore, it turn limewater into milky.

52. (D) Binary fission is an asexual method of reproduction and is observed in amoeba, euglena and paramecium.

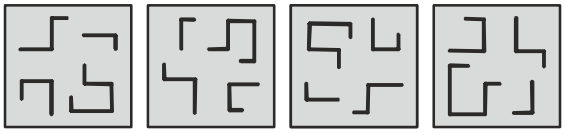
53. (C) Camel is a desert animal. To adapt to the desert habitat camel have long and buhy eyelashes, cushioned feet.

54. (C) Fibre X is wool.

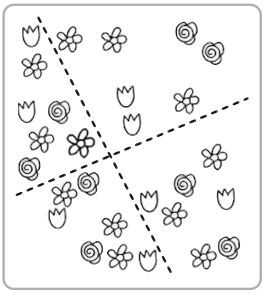
55. (C) Part labelled X is pulp.

CRITICAL THINKING

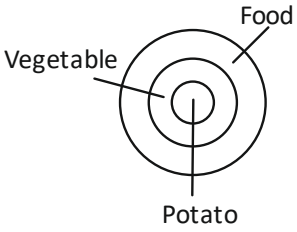
56. (C) The shape itself turn left 90 degrees



57. (A)



58. (A) Potato is a vegetable and all vegetables are food.



59. (B) 105 kg; 250 × 0.7 × 0.8 × 0.75

60. (C)