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NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION

CLASS - 8
Question Paper Code : UN484

KEY

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

SOLUTIONS

MATHEMATICS

01. (C) $\sqrt{\dfrac{(666666)^2}{12345654321}} = \sqrt{\dfrac{(666666)^2}{(111111)^2}}$

$= \sqrt{\left(\dfrac{666666}{111111}\right)^2} = \dfrac{\overset{6}{\cancel{666666}}}{\cancel{111111}}$

02. (B) $\dfrac{2x}{3x^2-5x+3} = \left(\dfrac{\left(\dfrac{2x}{x}\right)}{\left(\dfrac{3x^2-5x+3}{x}\right)}\right)$

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

$= \dfrac{2}{3\times5-5} = \dfrac{\overset{1}{\cancel{2}}}{\cancel{10}5} = \dfrac{1}{5}$

03. (D) Given $(x+y+z)(x+y-z) = 18$ ..... (1)

$(x+y+z)(y+z-x) = 52$ ..... (2)

$(x+y+z)(z+x-y) = 30$ ..... (3)

Eq(1) + (2) + (3)

$\Rightarrow (x+y+z)(x+y-z) + (x+y+z)(y+z-x) + (x+y+z)$

$(z + x - y) = 18 + 52 + 30 = 100$

$\Rightarrow$ $(x + y + z)[x + y - \cancel{z} + \cancel{y} + 3 - \cancel{x} + \cancel{z} + \cancel{x} - \cancel{y}] = 100$

$\Rightarrow$ $(x + y + z)^2 = 10^2$

$\therefore$ $x + y + z = 10.$

04. (D)   Area of the unshaded region = 4 times the area of semicircle of diameter 7 cm

$$= \overset{2}{\cancel{4}} \times \frac{1}{\cancel{2}} \pi r^2$$

$$= \cancel{2} \times \frac{\overset{11}{\cancel{22}}}{\cancel{7}} \times \frac{\cancel{7}}{\cancel{2}} \times \frac{7}{\cancel{2}} \, cm^2$$

$= 77 \, cm^2$

$\therefore$ Area of the shaded region = square area − unshaded area

$= (14 \, cm)^2 − 77 \, cm^2$

$= 196 \, cm^2 − 77 \, cm^2$

$= 119 \, cm^2$

05. (B) $x^2 + y^2 = \left(\dfrac{2t}{1+t^2}\right)^2 + \left(\dfrac{1-t^2}{1+t^2}\right)$

$$= \frac{4t^2}{(1+t^2)^2} + \frac{(1-t^2)^2}{(1+t^2)^2}$$

$$= \frac{4t^2+1-2t^2+t^4}{(1+t^2)^2} = \frac{\cancel{(1+2t^2+t^4)}^1}{\cancel{(1+2t^2+t^4)}_1}$$

06. (C)   Area of square = s^2

$= (x − y − z)^2$ square units

$= (x^2 + y^2 + z^2 − 2xy + 2yz − 2zx)$ square units

07. (D) $10^{\left(\frac{x}{2}+1\right)} = 10^{\frac{x}{2}} \times 10$

$$= (10^x)^{\frac{1}{2}} \times 10 = (64)^{\frac{1}{2}} \times 10$$

$$= (8^{\cancel{2}})^{\frac{1}{\cancel{2}}} \times 10 = 80$$

08. (B)   Volume of wooden box

$= 600 \, cm \times 700 \, cm \times 9 \, cm$

Volume of each box $= 6 \, cm \times 7 \, cm \times 9 \, cm$

$\therefore$ Number of boxes

$$= \frac{\text{Volume of wooden box}}{\text{Volume of each box}}$$

$$= \frac{600 \times 700 \times 9 \, cm^3}{6 \times 7 \times 9 \, cm^3} = 100000$$

09. (D)   We have,

$$\frac{1}{x+1} + \frac{1}{x+2} = \frac{2}{x+10}$$

Multiplying both sides by $(x + 1)$ $(x + 2)$ $(x + 10)$ i.e., the LCM of $x + 1$, $x + 2$ and $x + 10$, we get

$$\frac{(x+1)(x+2)(x+10)}{x+1} + \frac{(x+1)(x+2)(x+10)}{x+2}$$

$$= \frac{2(x+1)(x+2)(x+10)}{x+10}$$

$\Rightarrow$ $(x + 2)(x + 10) + (x + 1)(x + 10) = 2(x + 1)(x + 2)$

$\Rightarrow$ $x^2 + 2x + 10x + 20 + x^2 + 10x + x + 10 = 2(x^2 + x + 2x + 2)$

$\Rightarrow$ $2x^2 + 23x + 30 = 2(x^2 + 3x + 2)$

$\Rightarrow$ $2x^2 + 23x + 30 = 2^2 + 6x + 4$

$\Rightarrow$ $2x^2 + 23x − 2x^2 − 6x = 4 − 30$

$\Rightarrow$ $17x = − 26$

$\Rightarrow$ $x = -\dfrac{26}{17}$

Hence, $x = -\dfrac{26}{17}$ is the solution of the given equation

10. (C) $\dfrac{3(3y+4)+2(2y-5)}{6} = \dfrac{31}{2}$

$9y + 12 + 4y − 10 = \dfrac{31}{2} \times 6$

$13y = 93 + 10 − 12$

$y = \dfrac{91}{13} = 7$

11. (D) Given AD∥BC $\Rightarrow \angle C + \angle D = 180°$

$120° + \angle D = 180°$

$\angle D = 180° - 120°$

$\angle D = 60°$

But $\angle EAB = \angle D = 60°$

∴ AB∥CD

[∵ corresponding angles are equal]

∴ $x = \angle C = 120°$

[∵ corresponding angles are equal]

12. (B) Cost of 1 metre =

$$\dfrac{₹180}{2\frac{2}{3}} = \dfrac{₹180}{\left(\frac{8}{3}\right)} = \dfrac{₹\cancel{180}^{45}}{\cancel{8}_2} \times \dfrac{3}{\cancel{6}} = \dfrac{₹135}{2}$$

∴ Cost of $3\frac{1}{3}$ metres cloth =

$$\dfrac{₹\cancel{135}^{45}}{\cancel{2}_1} \times \dfrac{\cancel{10}^5}{\cancel{3}_1} = ₹225$$

13. (B) In rhombus ABCD,

$\angle A + \angle B + \angle C + \angle D = 360°$

Since diagonals AC and BD bisect vertex angles,

$$\dfrac{\angle A}{2} + \dfrac{\angle B}{2} + \dfrac{\angle C}{2} + \dfrac{\angle D}{2} = \dfrac{360°}{2}$$

$\Rightarrow$ p + q + t + s = 180° ...... (1)

Now, $\angle r = 90°$ ...... (2)

(Since diagonals of a rhombus bisect at right angles.)

Adding (1) and (2), we get

p + q + r + s + t = 180° + 90°

∴ p + q + r + s + t = 270°

14. (B) If is in inverse variation

∴ $x_1 y_1 = x_2 y_2$

$\Rightarrow$ $28 \times 65 = 52 \times y_2$

$$y_2 = \dfrac{\cancel{28}^7 \times \cancel{65}^5}{\cancel{52}_{\cancel{13}_1}} = 35$$

15. (C) Angle of sector representing C is

$360° - 90° - 150° = 120°$

So, $\dfrac{1}{3}$ of the students scored grade C is

true, as $\dfrac{120°}{360°} = \dfrac{1}{3}$

16. (C) Let 2022 be 'a'

∴ 2023 = a + 1, 2024 = a + 2 & 2025 = (a + 3)

∴ $\sqrt{a(a+1)(a+2)(a+3)+1} = \sqrt{a(a+3)(a+1)(a+2)+1}$

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

$= \sqrt{(a^2 + 3a)[(a^2 + 3a) + 2] + 1}$

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

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

$= 2022^2 + 3(2022) + 1$

$= 4088484 + 6066 + 1$

$= 4094551$

17. (B) $\sqrt[3]{\dfrac{1}{2} \times \dfrac{2}{3} \times \dfrac{3}{4} \times .... \times \dfrac{999}{1000}} = \sqrt[3]{\dfrac{1}{1000}} = \dfrac{1}{10}$

18. (C)

```
13 | 634933
   13 | 48841
      13 | 3757
         17 | 289
              17
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∴ 6,34,933 = $13^3 \times 17^2$

∴ 6,34,933 should be multiplied by 17 to make it a perfect cube

19. (A) Suppose S.P. = ₹100

Profit = ₹20% of SP = $\dfrac{20}{100} \times ₹100 = ₹20$

C.P. = ₹(100 − 20) = ₹80

Profit % = $\dfrac{\text{profit}}{\text{C.P.}} \times 100$

$= \dfrac{20}{80} \times 100 = 25\%$

20. (C) Let the number to be added each number of the proportion be 'x'

Given $(1 + x)$, $(5 + x)$, $(7 + x)$, $(19 + x)$, are in proportion.

∴ $(1 + x)(19 + x) = (5 + x)(7 + x)$

$19 + x + 19x + x^2 = 35 + 5x + 7x + x^2$

$20x + 19 = 14x + 35$

$20x - 12x = 35 - 19$

$8x = 16$

$x = \dfrac{16}{8} = 2$

∴ '2' to be added

21. (B) $\dfrac{x - y}{\sqrt{x} + \sqrt{y}} = \dfrac{(\sqrt{x})^2 - (\sqrt{y})^2}{\sqrt{x} + \sqrt{y}}$

$= \dfrac{(\sqrt{x} + \sqrt{y})(\sqrt{x} - \sqrt{y})}{(\sqrt{x} + \sqrt{y})}$

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

22. (A) $2\sqrt{3}x^2 - x - 5\sqrt{3}$

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

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

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

23. (D) $5^{x-3} \times 3^{2x-8} = 225 = 15^2 = 5^2 \times 3^2$

∴ $x - 3 = 2$

$x = 2 + 3 = 5$

24. (D) Volume of tank = Volume of cylinder

$66 \text{ cm} \times 28 \text{ cm} \times h$

$= \pi \left(\dfrac{\cancel{84}^{42}}{\cancel{2}_{1}} \text{ cm}\right)^2 \times 28 \text{ cm}$

$h = \dfrac{\cancel{22}^{2}}{\cancel{7}_{1}} \times \cancel{42}^{2} \times 42 \times \cancel{28} \times \dfrac{1}{\underset{\underset{1}{11}}{66}} \times \dfrac{1}{\cancel{28}}$

$= 84 \text{ cm}$

25. (C) $4x^2 + 12x + 9 = (2x)^2 + 2(2x)(3) + 3^2$

$= (2x + 3)^2$

Given $s^2 = (2x + 3)^2$

∴ $s = (2x + 3)$

∴ Perimeter of the square $= 4s = 4(2x + 3)$

$= (8x + 12)$

PHYSICS

26. (C) As medium X brought the sound from the sound producing body to the man most quickly, it is a solid.

As medium Z takes maximum time for the sound from the sound producing body to reach the man, it is a gas.

As medium W took less time than that of X i.e., solid and more than that of Z i.e., gas, W is a liquid for the sound from the sound producing body to reach the man.

As medium Y fails to bring the sound from the sound producing body to the man, it is vacuum. So, medium W is a liquid, X is a solid, Y is vacuum and Z is a gas.

27. (C) The body will move in the direction that is the resultant of the two forces F_1 and F_2. This is direction R as it is the only direction that falls between these two forces.

Option (A) : Direction P is outside either of the forces F_1 or F_2 and it is not possible.

Option (B) : Direction S is in the same direction as F_1 and it is not possible.

Option (D) : Direction Q is in the same direction as F_2 and it is not possible.

28. (B) A point on the surface of the earth which lies vertically above the focus of an earthquake.

29. (C) The amount of friction (frictional force) produced depends on the texture of surfaces in contact. A rough surface produces more friction than a smooth surface.

The Earth's gravity or gravitational force is a force that pulls everything on the Earth down towards the centre of the Earth. It acts on the toy car when it is placed on both the surfaces.

The toy car slides down when placed on Surface S because the gravitational force acting on the toy car is greater than the frictional force acting against the movement of the toy car.

The toy car did not slide down when placed on Surface T because the gravitational force acting on the toy car is not able to overcome the frictional force acting against the movement of the toy car.

30. (A) Among the two liquids or electrolytes, the bulb in liquid P glowed more brightly than the bulb in liquid Q.

Liquid P is a better or good conductor of electricity as it is a strong electrolyte.

Liquid Q is a weak electrolyte due to this reason, the bulb in liquid Q glowed less brightly than liquid P.

31. (B) For a plane mirror, the distance between the image and mirror is same as between the object and the plane mirror.

∴ To get a distance of 5 m between the girl and her image, she should move 2.5 m towards the mirror.

32. (C) Pressure is defined as force acting per unit area.

$$\text{Pressure, P} = \frac{\text{Force}}{\text{Area}} = \frac{80}{10 \times 5} \text{ N/cm}^2$$

33. (D) The mass of cathode increases as the copper is deposited on it.

$$Cu^{2+} + 2e^- \longrightarrow Cu$$
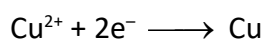
34. (C) Friction does not depend on the area of contact of any object/block. Hence, friction is equal in both the blocks. It depends on the nature of two surfaces in contact and weight of the object.

35. (C) The points on either side of point O of a plane mirror can be reflected when light rays are incident on them.
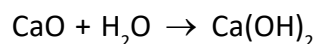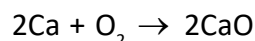
CHEMISTRY

36. (A) Group P: Man-made resources - Detergents, polythene

Group Q: Exhaustible natural resources- Coal, natural gas, black gold, minerals, forests

Group R: Inexhaustible natural resources - Air, sunlight, oxygen (as a constituent of air)

37. (C) P is a metal and Q is a non-metal

$$2Ca + O_2 \rightarrow 2CaO$$

$$CaO + H_2O \rightarrow Ca(OH)_2$$

38. (C) Paper pan does not catch fire but water in the pan absorbs heat from the candle flame and does not let the paper attain its ignition temperature.

39. (C) Coal gas is a mixture of hydrogen, carbon monoxide and methane.

40. (A) Statements I, II and IV are correct. Thermosetting plastics cannot be moulded again and again.

41. (B) Only highly reactive metals like magnesium, aluminium, etc., displace hydrogen from dilute acids, which burns with pop sound

42. (C) Candle, magnesium ribbon, petrol, camphor and paper produce flame on burning. Charcoal does not burn with a flame but glows producing heat and light.

43. (C) Natural fabrics take more time to dry than synthetic fabrics. The correct order of time taken for drying is Wool > Cotton > Acrylic > Polyester

44. (B) P – Aluminium – Conductor of electricity, malleable and lustrous.

Q – Iodine – Lustrous, non- conductor of electricity and not - malleable.

R – Graphite – Conductor of electricity, not - malleable and lustrous.

S – Sulphur – Non-conductor of electricity, not - malleable and not lustrous).

45. (C) When fuel is burnt, oxides of sulphur and nitrogen are produced. These oxides when dissolve in rainwater makes it acidic called acid rain

BIOLOGY

46. (A) The agricultural practice followed is crop rotation.

47. (D) X – Chlorophyll, Y – Respiration, Z – in damp places.

48. (D) Uncontrolled deforestation leads to:

    (i) Destruction of habitats

    (ii) Soil erosion and

    (iii) Flooding

49. (C) X - nucleus; Y - endoplasmic reticulum.

50. (C) Metamorphism is a hormonal effect. Metamorphism in frogs is controlled by the hormones called thyroxine, and it is produced by the gland called thyroid.

51. (D) The advantages of levelling of soil are:

    (i) Levelling helps to prevent soil erosion caused by wind or air.

    (ii) It helps in sowing the seeds uniformly, and thus helps the plants to grow uniformly too.

    (iii) It helps in proper irrigation by allowing the water to get distributed uniformly throughout the soil.

52. (A) P: Salting and dehydration, Q: Pickling, R: Pasteurization

53. (C) Golgi bodies is the cell organelle that was named after the name of its discoverer Camillo Golgi.

54. (D) In Hydra, a bud forms which breaks away from the main body and develops into an adult. The process is an asexual reproduction. A small protuberance arises from one side of the body while budding. This protuberance develops into hypostome, tentacles and basal disc.

55. (B) Parathyroid and thyroid all these glands helps in regulating calcium levels in human.

CRITICAL THINKING

56. (C) Most Himalayan rivers originating in Himalayan peaks are perennial because they are fed by the melting snow throughout the year. Hence option (C) is correct.

57. (B) Wheels G, E, C and B are rotated in anti-clockwise direction.
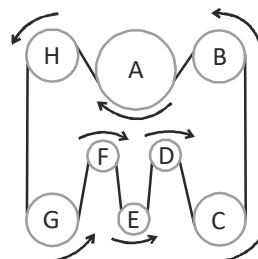
58. (B) Snake is different from lizard but both are reptiles.

59. (A) On the basis of the given information and data we can prepare the following table.

Floor	Person	Wifi
Top	R	A
Fourth	P	E
Third	S	B
Second	U	D
First	Q	F
Ground	T	C

60. (A) S