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NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION (UPDATED)

CLASS - 8

Question Paper Code : UN487

KEY

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

SOLUTIONS

MATHEMATICS

01. (A) LHS =

$= \sqrt{10+\sqrt{25+\sqrt{108+\sqrt{154+15}}}}$

$= \sqrt{10+\sqrt{25+\sqrt{108+\sqrt{169}}}}$

$= \sqrt{10+\sqrt{25+\sqrt{108+13}}}$

$= \sqrt{10+\sqrt{25+\sqrt{121}}}$

$= \sqrt{10+\sqrt{25+11}}$

$= \sqrt{10+\sqrt{36}} = \sqrt{10+6}$

$= \sqrt{16} = 4$

02. (D) $\dfrac{x^4-y^4}{x+y} = \dfrac{\left(x^2\right)^2-\left(y^2\right)^2}{(x+y)}$

$= \dfrac{\left(x^2-y^2\right)\left(x^2+y^2\right)}{(x+y)}$

$= \dfrac{(x+y)(x-y)\left(x^2+y^2\right)}{(x+y)}$

$= (x^3 + xy^2 - x^2y - y^3)$

03. (D) Sum of the digits of the given number = 87

$\therefore$ Given number is divisible by 3

An even number divisible by '3' is also divisible by 6.

Last three digits are divisible by 8

$\therefore$ Given number is divisible by 8

A number which is divisible by 6 & 8 then it is divisible by its LCM i.e. 24.

04. (C) Given R – r = 7 cm _____ (1)

and $\pi R^2 - \pi r^2 = 1078\ cm^2$

$\pi(R^2 - r^2) = 1078\ cm^2$

$\frac{22}{7}(R + r)(R - r) = 1078\ cm^2$

$\frac{22}{7}(R + r)(y\ cm) = 1078\ cm^2$

$\therefore R + r = \frac{1078\ cm^2}{22\ cm} = 49\ cm$

R + r = 49 cm _____ (2)

Eq (1) + (2)

R – r + R + r = 7 cm + 49 cm

2R = 56 cm

$R = \frac{56}{2} cm = 28\ cm$

$\therefore$ 28 cm + r = 49 cm

$\therefore$ r = 49 cm – 28 cm = 21 cm

Similar circle circumference = $2\pi r$

$= 2 \times \frac{22}{7} \times 21\ cm$

= 132 cm

05. (B) Given $\frac{x}{x^{1.5}} = \frac{8}{x^{2.5}}$

$\frac{x^{2.5} \times x}{x^{1.5}} = 8$

$x^{2.5+1-1.5} = 8$

$x^2 = 8$

$x = \pm\sqrt{8}$

$x = \pm 2\sqrt{2}$

06. (C) Let the number to be multiplied be 'x'

Given $\left(-\frac{1.5}{28}\right)x = \frac{4}{3}$

$x = \frac{4}{3} \times \frac{-28}{15} = -\frac{112}{45}$

07. (D) $\frac{-1}{4} = -0.25$; $\frac{-1}{3} = -0.33$

$\frac{-5}{16} = -0.3125$

$\frac{-7}{24} = -0.29$; $\frac{-13}{48} = -0.27$

So $\frac{-7}{24}$, $\frac{-5}{16}$ and $\frac{-13}{48}$ lie between $\frac{-1}{4}$ and $\frac{-1}{3}$

08. (A) Perimeter of the rectangle = 60 cm

From the figure, length is (3k – 2) cm and breadth is (k + 4)cm

$\therefore$ 2[3k - 2) + (k + 4)] = 60

$\Rightarrow$ 2[4k + 2] = 60

$\Rightarrow$ 4k + 2 = 30

$\Rightarrow$ 4k = 28

$\therefore k = \frac{28}{4} = 7$

The required 3 numbers are 20, 21, 22

09. (A) Let the breadth of the given rectangle = x cm.

Then, its length = $(x + 9)$ cm.

Area of the given rectangle = $[x(x+9)]\ cm^2$,

New breadth = $(x + 3)$ cm.

New length = $[(x + 9) + 3]$cm = $(x + 12)$ cm.

Area of the new rectangle = $[(x + 12)(x + 3)]\ cm^2$

(Area of new rectangle) – (Area of given rectangle) = $84\ cm^2$

$(x + 12)(x + 3) - x(x + 9) = 84$

$(x^2 + 15x + 36) - (x^2 + 9x) = 84$

$6x + 36 = 84$

$6x = 48$

$x = \frac{48}{6} = 8$

Thus, breadth = 8 cm

And, length = (8 + 9) cm = 17 cm

Perimeter = 2(l + b) = 2(17 + 8)cm

= 2 × 25 cm = 50 cm

10. (B) $\text{CP}\left(\frac{100+15}{100}\right) = ₹322$

$\therefore$ CP $= ₹322 \times \frac{100}{115}$

CP of the bouquet = ₹280

SP of boquet $= \text{CP}\left(\frac{100+g}{100}\right) = ₹280$

$\times\frac{125}{100} = ₹350$

11. (D) Amount after $2\frac{3}{4}$ years

$$= ₹\left[31250\times\left(1+\frac{8}{100}\right)^2\times\left\{1+\frac{\frac{3}{4}\times 8}{100}\right\}\right]$$

$$= ₹\left[31250\times\left(\frac{27}{25}\right)^2\times\left(\frac{53}{50}\right)\right]$$

$$= ₹\left[31250\times\frac{27}{25}\times\frac{27}{25}\times\frac{53}{50}\right]$$

= ₹ 38637

$\therefore$ Amount = ₹ 38637

Hence, compound interest

= ₹ (38637 – 31250) = ₹ 7387

12. (C) The difference between the highest number and the lowest number of cell phones sold = 15 = (8 – 3) units = 5 units

$\therefore$ 1 unit = 3 cell phones,

$\therefore$ No. of cell phones sold on Thursday

= 6 × 3 = 18

13. (A) It is in direct proportion

$\therefore \frac{x_1}{y_1} = \frac{x_2}{y_2}$

$\frac{11 \text{ men}}{6\frac{3}{4}\text{m}} = \frac{x_2}{27\text{m}}$

$\frac{11\times 27\text{m}}{\left(\frac{27}{4}\right)\text{m}} = x_2$

$11 \times 27 \times \frac{4}{27}\text{men} = x_2$

$\therefore$ 44 men required

14. (B) It is in inverse proporsion

$\therefore x_1y_1 = x_2y_2$

$700 \times 54 = (700 + 200) \times y_2$

$y_2 = \frac{700\times 54}{900}$ = 42 days.

15. (A)

4	18670918 16	4321
83	267 249	
862	1809 1724	
8641	8518 8641	
	−123	

$4321^2 = 18670918 + 123 = 18671041$

16. (C) Given BD // AE.

$\angle DCE = \angle CEA \longrightarrow (1)$

$\angle BCA = \angle CAE \longrightarrow (2)$

$\therefore$ From eg. & $\angle CEA = \angle CAE$

$\Rightarrow$ DACE is isosceles.

$\Rightarrow$ CE = AC = 3 cm.

17. (B) Given $\frac{x^{3a+3b}x^{3b+3c}x^{3c+3a}}{x^{6a+6b+6c}}$

$= \frac{x^{3a+3b+3b+3c+3c+3a}}{x^{6a+6b+6c}} = \frac{x^{6a+6b+6c}}{x^{6a+6b+6c}}$

$= \underline{x}^{6a+6b+6c-6a-6b-6c} = \underline{x}^{\circ} = 1$

18. (C) Given $2\pi r = 220$ cm

$2 \times \frac{22}{7} r = 220$ cm

$r = 220 \text{ cm} \times \frac{7}{44} = 35$ cm

Volume of the cylinder

$= \pi r^2 h = \frac{22}{\cancel{7}} \times \cancel{35}^{5} \times 35 \times 63 \text{ cm}^3$

$= 2,42,550 \text{ cm}^3$

19. Delete

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

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

$= \left(a^{\frac{1}{3}} \times a^{\frac{2}{3}} - a^{\frac{1}{3}} \times a^{\frac{1}{3}} \times b^{\frac{1}{3}} + a^{\frac{1}{3}}b^{\frac{2}{3}} + a^{\frac{2}{3}}b^{\frac{1}{3}} - a^{\frac{1}{3}} \times b^{\frac{1}{3}} \times b^{\frac{1}{3}} + b^{\frac{1}{3}} \times b^{\frac{2}{3}}\right)$

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

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

$= a^{\frac{3}{3}} + b^{\frac{3}{3}}$

$= (a + b)$

21. (B) In ΔADE, $\angle E = 90°$

$AD^2 = AE^2 + DE^2$

[$\because$ Pythagorus therem]

$50^2 = 14^2 + DE^2$

$50^2 - 14^2 = DE^2$

$(50 + 14)(50 - 14) = DE^2$

$DE = \sqrt{64 \times 36} = 8 \times 6 = 48$

Remaining area of the trapezium = Area of the trapezium – Area of the quarter circle

$= \frac{1}{2} \times AE(AB + CD) - \frac{1}{4} \times \pi r^2$

$= \frac{1}{2} \times 14 \text{ cm}(42 + 42 + 48)\text{cm} - \frac{1}{4} \times \frac{22}{7} \times 14 \times 14 \text{ cm}^2$

$= 924 \text{ cm}^2 - 154 \text{ cm}^2$

$= 770 \text{ cm}^2$

22. (A) $(9x + 4)(2x + 9) = (18x - 4)(x + 6)$

$9x(2x + 9) + 4(2x + 9) = 18x(x + 6) - 4(x + 6)$

$18x^2 + 81x + 8x + 36 = 18x^2 + 108x - 4x - 24$

$18x^2 + 89x + 36 - 18x^2 = 104x - 24$

$36 + 24 = 104x - 89x$

$15x = 60$

$x = \frac{60}{15} = 4$

23. (C) The bacteria two hours back be 'x'

Given $x\left(1 + \frac{2.5}{100}\right)^2 = 5,37,920$

$x\left(1 + \frac{25}{1000}\right)^2 = 5,37,920$

$x \times \frac{41}{40} \times \frac{41}{40} = 5,37,920$

$x = 5,37,920 \times \frac{40}{41} \times \frac{40}{41}$

$= 5,12,000$

24. (C) $(87654322)^2 - (12345678)^2 = (87654322 - 12345678)\ (87654322 + 12345678)$

$= 75308644 \times 100000000$

$= 7530864400000000$

25. (B) Let each equal angle be 'x'

Given $\angle x = 360°$

$$x = \frac{360°}{4} = 90°$$

PHYSICS

26. (A) The longer the length of rubber band, the lower is the pitch. The shorter and thicker the rubber band, the higher is the pitch.

27. (A) For larger cube, mass increases by 8 times and base area increase by 4 times. Pressure increases by 8/4 = 2 times.

28. (D) The given sentences can be completed with correct words like electric discharge, clouds, earth.

29. (B) The direction of friction F always opposes the direction of the pulling force, P.

The weight of object, always acts vertically downwards from the centre of gravity of the object.

30. (A) In the electrolysis of $CuSO_4(aq)$ using Cu electrodes, the Cu anode dissolves to form Cu^{2+} while Cu is deposited at the Cu cathode.

Anode :

$$Cu(s) \longrightarrow Cu^{2+}(aq) + 2e^-$$

Cathode :

$$Cu^{2+}(aq) + 2e^- \longrightarrow Cu(s)$$

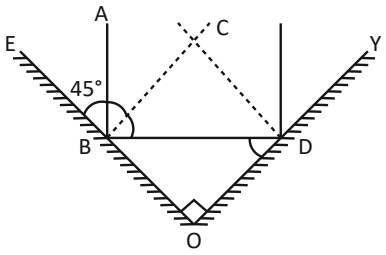
The overall result is the transfer of Cu from anode to cathode and there is no change in the concentration of the solution.

31. (C) $\angle ABE = 45°$

$\angle ABE + \angle ABC = 90°$

(BC is normal to the surface)

$\Rightarrow$ $\angle ABC = 90° - 45° = 45°$



$\angle ABC = \angle CBD$ $[\angle i = \angle r]$

$\angle CBD = \angle BDO$ [alternate angles] $= 45°$

$\angle BDO + \angle BDC = 90°$

[CD is normal to the surface]

$45° + \angle BDC = 90°$

$\angle BDC = 45°$

$\therefore$ $\angle i = \angle r = 45°$ for mirror Y

32. (D) The overall force pulling the skater towards his friend is 40 N. There is no friction to counteract this force. Thus, the skater moves towards his friend. The forces acting on the skater are the gravitational force pulling downwards on him and the upward push of the floor on him.

33. (D) For electroplating iron spoon with copper, copper plate acts as positive electrode (+), iron spoon acts as negative electrode (–) with copper sulphate solution as electrolyte.

34. (A) We move faster on roller-skater than on shoes as they have rollers to roll easily thereby reducing friction.

35. (C) Light rays travel in a straight line is correctly shown in cardboards 1 and 3.

CHEMISTRY

36. (C) X = Sunlight - An inexhaustible natural resource.

Y = Unlimited in quantity in nature.

Z = Never gets exhausted by human activities.

37. (A) The number of bubbles indicate the rate of reaction, which is indicative of the reactivity of the metals. Only option (A) gives the correct indication of the relative reactivity of the three metals, with Mg being the most reactive followed by Fe and Cu being unreactive with dilute hydrochloric acid.

38. (C) The amount of heat energy produced on complete combustion of 1 kg of a fuel is called its calorific value. It is expressed in units of kJ/kg. Fuels like wood and coal release unburnt carbon particles which are pollutants and cause many respiratory diseases such as asthma.

39. (B) Statements (I) and (II) are correct. Bakelite is used to make electric plugs, switches etc., as it is bad conductor of electricity.

Synthetic materials are not used in kitchen.

Blended fabrics are long lasting as they contain both synthetic and natural fibers.

40. (A) Metals are good conductors of heat and have high melting points. Lead and mercury are poor conductors of heat, whereas silver and copper are good conductors of heat.

41. (D) Group P - I - Coal, II-Wood, III - Natural gas and VIII - Cowdung cake are Natural fuels.

Group Q - V-Kerosene, VI - LPG, VII - Coke and IX - Petrol are Processed fuels.

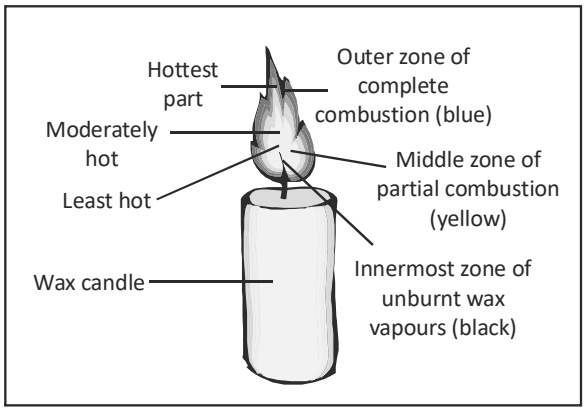
Group R - I- Coal, III - Natural gas and IV - Petroleum are Fossil fuels.

42. (C) X is sodium, a highly reactive metal. Y is Iodine is a lustrous non-metal and a bad conductor of electricity. Graphite is a non-metal and a good conductor of electricity. So, it has metallic lustre.

43. (C) Metals are good conductors of electricity; thermoplastics are bad conductor of electricity.

44. (C) The correct matching of correct part, zone and colour of a burning candle is P - (iii), (x); Q - (ii), (z); R - (i), (y)

Given below is a figure showing different parts, zones and colours of a burning candle flame.



45. (A) X being heavy is(water), Y being lighter than water floats above water is (crude oil) and Z is more lighter than crude oil is (natural gas).

BIOLOGY

46. (C) Fertilizer is an artificial or man-made inorganic salt, that causes soil and water pollution and is soluble in water.

47. (B) Malaria is a fatal disease caused by plasmodium species. It shows the symptoms of high fever shaking, chills and flu like illness.

48. (B) Biodiversity is the totality of genes, species and ecosystems of a region.

49. (D) Offspring of viviparous animals survive better than the offspring of oviparous animals because of the proper embryonic care and protection is present.

50. (D) The fusion of male and female gametes in human beings usually takes place in fallopian tube.

51. (D) Some bacteria eat up toxic chemicals, plastics, organic waste materials and help us in cleaning the environment.

52. (C) The presence of thylakoids makes plastids different from mitochondria.

53. (B) Ovum is the female gamete. They are also called egg. They are produced by the female reproductive organ. They consist of larger nucleus. Sperm (Y) is produced by testes in a male gamete cells.

54. (C) The cell formed after fertilization is known as zygote.

55. (C) Nitrogen can be replinished naturally in the soil following crop rotation method.

CRITICAL THINKING

56. (C) Both I & II follows

57. (A) 

58. (B) Rectangle ACLO

Total number of right angled triangles

AOM, AOL, QLN, ACL, ABP, PNM, ABQ = 7

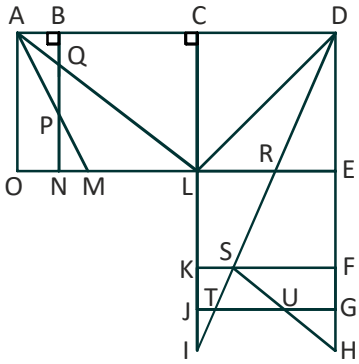
From square CLED

Number of right angled triangles are

DCL, LED, RED = 3

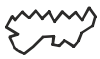
Number of right angled triangles from LEHI are LRI, KSI, JTI, SFD, SFH, UGH, CDI, DTG = 8

7 + 3 + 8 = 18



59. (B) Monday

Four days before Monday is Thursday and day before day before Thursday is Monday.

60. (A) 

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