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NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION (UPDATED)

CLASS - 7

Question Paper Code : 1P204

KEY

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

SOLUTIONS

01. (B) 2024^{th} whole number in the ascending order = 2023

Range = Highest value – Lowest value = 2023 – 0 = 2023

02. (D) Given $2\pi r = 66$ cm

$$2 \times \frac{22}{7} \times r = 66 \text{ cm}$$

$$r = \frac{\cancel{66}^{3}}{} \times \frac{7}{\cancel{44}_{2}} \text{ cm}$$

$$= \frac{21}{2} \text{cm}$$

$$\text{Area of a circle} = \frac{\cancel{21}^{11}}{\cancel{2}_{1}} \times \frac{\cancel{21}^{3}}{\cancel{2}_{1}} \times \frac{21}{2} \text{cm}^2$$

$$= \frac{693}{2} \text{cm}^2 = 346.5 \text{ cm}^2$$

03. (D) LCM of 4, 12, 24 & 16 = 48

$$\frac{-3}{4} = \frac{-3}{4} \times \frac{12}{12} = \frac{-36}{48}, \frac{-7}{12} = \frac{-7}{12} \times \frac{4}{4} = \frac{-28}{48},$$

$$\frac{-19}{24} = \frac{-19}{24} \times \frac{2}{2} = \frac{-38}{48}, \frac{-5}{16} = \frac{-5}{16} \times \frac{3}{3} = \frac{-15}{48}$$

$$\therefore \frac{-38}{48} < \frac{-36}{48} < \frac{-28}{3} < \frac{-15}{48}$$

$\therefore$ Greatest rational number = $-\frac{5}{16}$

04. (C) $x + y + z = 360°$

$\Rightarrow x + x + x = 360°$ [$\because$ Given $x = y = z$]

$\Rightarrow x = 120$

$\Rightarrow \angle ABC = x = 120°$

05. (C) $\angle AFG = \angle C + \angle E$ & $\angle AGF = \angle B + \angle D$

$\therefore \angle A + \angle B + \angle C + \angle D + \angle E$

$= \angle A + \angle C + \angle E + \angle B + \angle D$

$= \angle A + \angle AFG + \angle AGF = 180°$

06. (D) $$\frac{(2.4)^3 + 0.064}{(2.4)^2 - 0.96 + 0.16} = \frac{13.824 + 0.064}{5.76 - 0.96 + 0.16}$$

$$= \frac{13.888}{4.96}$$

$= 2.8$

07. (A) Total cost for painting

$= [2h(l + b)] \times$ Rs. 4

$= 12 \times 15 \times 4$

$=$ Rs. 720

08. (A) Let principal be Rs. x

$$\text{Amount} = \frac{41}{40}x$$

$$\text{I} = \text{A} - \text{P} = \frac{41x}{40} - x$$

$$\text{I} = \frac{x}{40}$$

$$\text{But I} = \frac{\text{PTR}}{100} = \frac{x}{40}$$

$$\frac{x \times \text{R} \times \frac{1}{4}}{100} = \frac{x}{40}$$

R = 10%

09. (B) Given 4SP = 4.5 CP

$$\text{SP} = \frac{4.5}{4}\text{CP} = \frac{45}{40}\text{CP}$$

$$\text{Profit} = \text{SP} - \text{CP} = \frac{9}{8}\text{CP} - \text{CP}$$

$$= \frac{1}{8}\text{CP}$$

$$\text{Profit percentage} = \frac{\text{P}}{\text{CP}} \times 100$$

$$= \frac{\frac{1}{8}\text{CP}}{\text{CP}} \times 10 = 12.5\%$$

10. (A) $\frac{6}{7} = 0.857, \quad \frac{7}{9} = 0.777$

$\therefore \frac{95}{112} = 0.848, \frac{99}{112} = 0.883,$

$\frac{3}{4} = 0.75, \frac{97}{112} = 0.866$

$\therefore$ 0.848 lies between 0.857 & 0.777

$\therefore \frac{7}{9} < \frac{95}{112} < \frac{6}{7}$

11. (C) The above given table is in the form of $y = 9x - 2$

12. (B) $$\text{LHS} = \frac{1}{3}y^2 - \frac{4}{7}y + 11 - \frac{1}{7}y$$

$$+ 3 - 2y^2 - \frac{2}{7}y + \frac{2}{3}y^2 - 2$$

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

$+ (11 + 3 - 2)$

$$= \left(\frac{-y^2 - 6y^2 + 2y^2}{3}\right) + \left(\frac{-4y - y - 2y}{7}\right) + 12$$

$$= \frac{-3y^2}{3} - y + 12$$

$= (-y^2 - y + 12)$

13. (D) Given $S_1 + S_2 + S_3 = 3322$ units .....(i)

Given $S_1 - S_2 + S_3 = 2024$ units .....(ii)

Eq (i) – eq (ii)

$\Rightarrow (S_1 + S_2 + S_3) - (S_1 - S_2 + S_3)$

$= (3322 - 2024)$ units

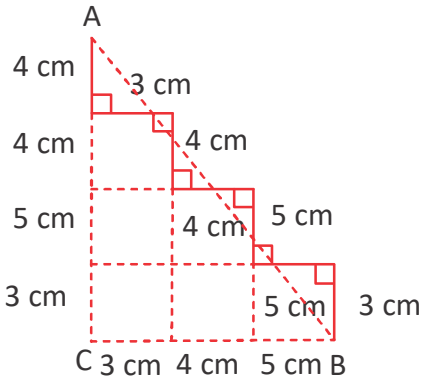
$\Rightarrow S_1 + S_2 + S_3 - S_1 + S_2 - S_3 = 1298$ units

$\Rightarrow 2S_2 = 1298$ units

$$S_2 = \frac{1298}{2} \text{ units}$$

$S_2 = 649$ units

14. (A)



$\therefore$ AC = (4 + 4 + 5 + 3) cm = 16 cm

BC = (3 + 4 + 5) cm = 12 cm

In ΔABC, $\angle C = 90° \Rightarrow AB^2 = AC^2 + BC^2$

($\because$ pythagurus theorem)

$= (16\text{ cm})^2 + (12\text{ cm})^2$

$= (256 + 144)\text{ cm}^2$

$= 400\text{ cm}^2$

$AB^2 = (20\text{ cm})^2$

$\therefore$ AB = 20 cm

15. (B) Sum of three consecutive numbers

= 1 + 2 + 3

= 2 – 1 + 2 + 2 + 1

= 2 × 3 = 6

= Middle number × 3

$\therefore$ Sum of 29 consecutive numbers

= 29 × middle number

= 29 × 29 = 841

16. (C) We have,

$$\left(\frac{12}{5}x^2yz-\frac{3}{5}xyz+\frac{2}{3}x^2y\right)-\left(\frac{3}{2}x^2y+\frac{4}{5}y-\frac{1}{3}x^2yz\right)$$

$$=\frac{12}{5}x^2yz-\frac{3}{5}xyz+\frac{2}{3}x^2y-\frac{3}{2}x^2y-\frac{4}{5}y+\frac{1}{3}x^2yz$$

$$=\frac{12}{5}x^2yz+\frac{1}{3}x^2yz+\frac{2}{3}x^2y-\frac{3}{2}x^2y-\frac{3}{5}xyz-\frac{4}{5}y$$

[Grouping line terms]

$$=\left(\frac{12}{5}+\frac{1}{3}\right)x^2yz+\left(\frac{2}{3}-\frac{3}{2}\right)x^2y-\frac{3}{5}xyz-\frac{4}{5}y$$

$$=\frac{41}{15}x^2yz-\frac{5}{6}x^2y-\frac{3}{5}xyz-\frac{4}{5}y$$

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

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

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

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

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

$x = 15 \times 8 = 120$ km

18. (B) $$\text{LHS}=\frac{3}{4}\left(\frac{1}{32}-\frac{1}{16}+\frac{1}{8}-\frac{1}{4}+\frac{1}{32}-\frac{1}{2}\right)$$

$$=\frac{3}{4}\left(\frac{1-2+4-8+1-16}{32}\right)$$

$$=\frac{3}{4}\times\frac{-\cancel{20}^{5}}{\cancel{32}_{8}}=\frac{-15}{32}$$

19. (C) In ΔABC, $27° + 99° + \angle BAC = 180°$

$126° + \angle BAC = 180°$

$\angle BAC = 180° - 126° = 54°$

But, $y + 23° + x + \angle BAC = 180°$

$x + y + 23° + 54° = 180°$

$x + y = 180° - 77° = 103°$

20. (D) In a parallelogram ABCD,

$\angle A + \angle B = 180^\circ$

$70^\circ + \angle B = 180^\circ$

$\Rightarrow \angle B = 110^\circ$

$\therefore \angle d = 110^\circ \quad [\because \angle B = 110°]$

$\therefore \angle B + \angle D = 110^\circ + 110^\circ = 220^\circ$

21. (D) $$\frac{0.08\times0.08\times0.08-0.02\times0.02\times0.02}{0.08\times0.08+0.08\times0.02+0.02\times0.02}$$

$$=\frac{0.000512-0.000008}{0.0064+0.0016+0.0004}$$

$$=\frac{0.00054}{0.0084}\times\frac{10,000}{10,000}$$

$$=\frac{5.04}{84}=0.06$$

22. (B) The cost of the bicycle after 1 year

$= ₹6000\frac{(100-10)}{100} = ₹5400$

$\therefore$ The cost of the bicycle after 2 years

$= ₹5400\frac{(100-10)}{100} = ₹4860$

23. (C) According to SAS criteria both triangles are congruent

24. (B) It has no line symmetry

25. (C) $\left[\frac{\left(a+\frac{1}{b}\right)^x\left(a-\frac{1}{b}\right)^y}{\left(b+\frac{1}{a}\right)^x\left(b-\frac{1}{a}\right)^y}\right]$

$= \frac{\left(\frac{ab+1}{b}\right)^x\left(\frac{ab-1}{b}\right)^y}{\left(\frac{ab+1}{a}\right)^x\left(\frac{ab-1}{a}\right)^y}$

$= \frac{\frac{(ab+1)^x}{b^x}\times\frac{(ab-1)^y}{b^y}}{\frac{(ab+1)^x}{a^x}\times\frac{(ab-1)^y}{a^y}}$

$= \frac{(ab+1)^x}{b^x}\times\frac{(ab-1)^y}{b^y}\times\frac{a^x}{(ab+1)^x}\times\frac{a^y}{(ab-1)^y}$

$= \frac{a^{x+y}}{b^{x+y}} = \left(\frac{a}{b}\right)^{(x+y)}$

PHYSICS

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

27. (A) When the air trapped in the dough of a cake gains heat, it expands, so the dough rises when heated. After taking out the cake from the oven for a few minutes, the cake will become cooler as it will lose heat to the surroundings. Hence, the air trapped in the cake will contract and occupy less space due to shrinking.

28. (B) $\text{Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{800}{160} = 5\ \text{m s}^{-1}$

29. (C) A single electric cell given 1.5 volts of electricity

No. of cells needed to light the torch

$= \frac{6}{1.5} = 4$

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

31. (A) In a distance-time graph, steeper the line, greater is the speed of the moving body, as the slope i.e. difference of distance for a given time interval is greater as steeper line is greater.

32. (A) When the switch of an electric bell is on, then electric current in it flows through the coils of an electromagnet, it behaves like a magnet and attracts the iron strip. When the iron strip moves towards the coil, the hammer connected to it strikes the gong and sound is produced. When the electric circuit is broken, the iron strip does not attract the coil of an electromagnet. Due to on and off electric current flows and stops in succession.

33. (B) A hot air balloon rises up because the hot air in the balloon is less dense than the cooler air surrounding it.

34. (D) Speed = 3.2 m s^{-1}

i.e., 3.2 m distance is covered in 1 second.

In 2 seconds, the man runs 2 × 3.2 m = 6.4 m.

In 1 min. i.e., 60 s he covers = 3.2 × 60 = 192 m.

35. (C) Statements (I) and (IV) are not true. Set-up X has two batteries and more number of turns of coil. Set-up Y has one battery and few turns of coil. Hence, steel nail in set-up X has attracted more iron pins than in set-up Y.

CHEMISTRY

36. (D) To reduce acidity in human stomach antacids like sodium bicarbonate (baking soda) or magnesium hydroxide (milk or magnesia) can be taken orally by mixing with water.

37. (D) During the process of crystallisation, on heating the solution, water evaporates faster, thus making the solution thick. Large crystals are formed that are pure with characteristic colour.

38. (C) Magnesium hydroxide is milk of magnesia, an antacid. It is not a source of magnesium hydroxide. White wash is calcium carbonate.

39. (A) Physical changes are temporary changes and can be reversed.

40. (D) Neutralisation is a chemical and irreversible change. The salt and water formed are new products and cannot be converted back to acid and base.

41. (A) To rust, the iron nail requires oxygen and water. There is no water present in setup 4 and air cannot dissolve in oil. This prevents rust from forming. In setup 2, as there is no water and dissolved oxygen, hydrogen peroxide can break down spontaneously to form oxygen and water, allowing rust to form. In setups 1 and 3 both contain dissolved oxygen in water.

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

43. (D) Heating of copper wire by using electricity is a physical change.

44. (B) When the yellow turmeric stain is rubbed with soap or detergent, its colour changes to brownish red as soap is a sodium salt of fatty acid and contains small amount of base.

45. (A) Ice on heating changes into water and water on heating changes into steam. Conversely, on cooling steam converts into water and water on freezing changes into ice. Thus, it is a physical and reversible change.

BIOLOGY

46. (D) Carbon dioxide was available to leaf P. Starch was present in leaf P indicating that it had carried out photosynthesis.

Carbon dioxide was not available to leaf Q. Starch was not present in leaf Q indicating that it had not carried out photosynthesis as sodalime absorbs carbon dioxide.

47. (B) P is a series of blood vessels that branches out along the side of the heart and supplies the heart muscles with oxygen and glucose. These are the coronary arteries.

48. (C) Most glucose is absorbed into the bloodstream.

49. (B) The walls of blood capillaries are one-cell thick to assist in the diffusion of substances.

50. (D) The breakdown of proteins

1. Occurs in the stomach due to the action of pepsin. It is a form of chemical digestion.
2. The churning action of the stomach helps to break the foood into smaller pieces. This is a form of physical digestion.
3. The hydrochloric acid produced helps to kill any micro-organisms that may have been ingested.
4. It also provides a suitable pH for the action of pepsin and rennin.

51. (C) He can use the Benedict's test to test for the presence of reducing sugars, and the iodine test to test for the presence of starch. The Biuret test is used to indicate the presence of proteins while the ethanol-emulsion test is used to indicate the presence of fats.

52. (A) Phagocytes are white blood cells which carry out phagocytosis to engulf and digest foreign particles. The lymphocytes, a type of white blood cell, is responsible for producing antibodies. Antigens (found on the cell surface membranes) are not formed by white blood cells but are expressed by the cells themselves. The clotting of blood is a result of the release of thrombokinase by platelets and a cascade of reactions involving plasma proteins. Hence, clotting is not considered a major function of the white blood cell.

53. (C) The guard cells regulate the size of the stomata in the leaf, through which water loss (transpiration) and gaseous exchange occur. Light is able to penetrate the leaf to reach its inner mesophyll layers easily, the guard cells and stomata play no part in enhancing this (2).

54. (D) The leaves make food which is transported to other plant parts for use.

Excess sugar is stored as starch in the storage parts.

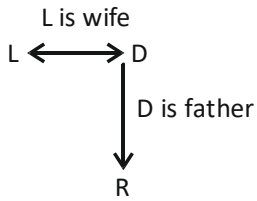
55. (D) Seeds only need water, air and warmth to germinate.

They do not need sunlight because they do not have leaves to make their own food.

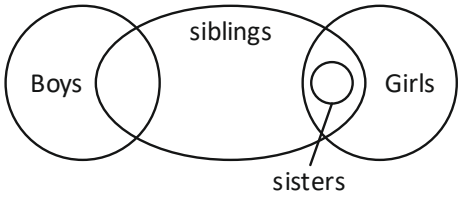
They get their food from the seed leaves.

CRITICAL THINKING

56. (B) L is the mother of R.



57. (C)



58. (A) So, the house arrangement is:

HNo.3

HNo.4

HNo.1

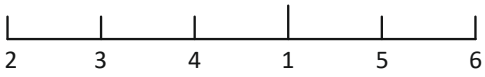
HNo.5

HNo.6

HNo.2

The house that is 2nd to the right of HNo.4 (which is in position 2) is in position 4.

Answer : HNo.5 is 2nd to the right of HNo.4.



59. (B) Assertion (A) : Polar bears are not found in Antarctica. This statement is true because polar bears are native to the Arctic region and are not found in Antarctica.

Reason (R) : Polar bears live in the Arctic region. This statement is also true as it correctly states the habitat of polar bears.

Both (A) and (R) are true but (R) is not the correct explanation of (A).

60. (A)