



NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION (UPDATED)

CLASS - 7
Question Paper Code : UN499

KEY

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

SOLUTIONS

MATHEMATICS

1. (B) $2^{71} + 2^{72} + 2^{73} + 2^{74} = 2^{71}(1 + 2 + 2^2 + 2^3)$
Rational number factors
 $= 2^{71}(3 + 4 + 8)$
 $= 2^{71} \times 15$
 $= 2^{70} \times 2 \times 5 \times 3$
 \therefore '10' is a factors of $(2^{71} + 2^{72} + 2^{73} + 2^{74})$

02. (C)
$$\frac{(0.7)^0 - (0.1)^{-1}}{\left(\frac{3}{8}\right)^{-1} \left(\frac{3}{2}\right)^3 + \left(\frac{-1}{3}\right)^{-1}} = \frac{\left(1 - \frac{1}{0.1}\right)}{\frac{8}{3} \times \frac{27}{8} + (-3)}$$

$$= \frac{1-10}{9-3} = \frac{-9}{6} = \frac{-3}{2}$$

03. (D) Let CP of each pencil be ₹ x
 \therefore CP of 13 pencils = ₹ $13x$
Given SP of 10 pencils = ₹ $13x$
 \therefore SP of each pencils = $\frac{₹13x}{10}$

$$\therefore \text{Profit} = \frac{₹13x}{10} - ₹x$$

$$= \frac{₹13x - ₹10x}{10} = \frac{₹3x}{10}$$

Profit percentage

$$= \frac{\text{Profit}}{\text{CP}} \times 100 = \frac{\left(\frac{\text{₹}3x}{10}\right)}{\text{₹}x} \times 100 = 30\%$$

04. (C) LHS = $\frac{1}{2} a^2b^2c - \frac{1}{5} a^2b^2c + \frac{1}{3} ab^2c + \frac{1}{6} ab^2c$

$$+ \left(-\frac{1}{4} abc^2 + \frac{1}{7} abc^2\right) - \frac{1}{8} a^2bc$$

$$= a^2b^2c \left(\frac{1}{2} - \frac{1}{5}\right) + ab^2c \left(\frac{1}{6} + \frac{1}{3}\right) + abc^2 \left(-\frac{1}{4} + \frac{1}{7}\right) - \frac{1}{8} a^2bc$$

$$= \frac{3}{10} a^2b^2c + \frac{1}{2} ab^2c - \frac{3}{28} abc^2 - \frac{1}{8} a^2bc$$

05. (D) LCM of 10, 15, 20 & 30 = 60

$$-\frac{7}{15} = -\frac{7}{15} \times \frac{4}{4} = -\frac{28}{60}$$

$$-\frac{11}{20} = -\frac{11}{20} \times \frac{3}{3} = -\frac{33}{60}$$

$$-\frac{17}{30} = -\frac{17}{30} \times \frac{2}{2} = -\frac{34}{60}$$

$$-\frac{3}{10} = -\frac{3}{10} \times \frac{6}{6} = -\frac{18}{60}$$

Ascending order is

$$-\frac{34}{60} < -\frac{33}{60} < -\frac{28}{60} < -\frac{18}{60}$$

$$\text{i.e., } -\frac{17}{30} < -\frac{11}{20} < -\frac{7}{15} < -\frac{3}{10}$$

∴ Descending order is

$$-\frac{3}{10} > -\frac{7}{15} > -\frac{11}{20} > -\frac{17}{30}$$

06. (C) $\angle P + \angle Q + \angle R + \angle S + \angle J + \angle U$

$$= \angle P + \angle Q + \angle POQ + \angle R + \angle S + \angle ROS + \angle T + \angle U + \angle TOU - \angle POQ - \angle ROS - \angle JOU$$

$$= 180^\circ + 180^\circ + 180^\circ - \angle POQ - \angle TOU - \angle TOU$$

$$= 540^\circ - (\angle POQ - \angle POU - \angle UOT)$$

$$= 540^\circ - 180^\circ$$

$$= 360^\circ$$

07. (B) Let original length & breadth be 'l' and 'b' respectively

Original perimeter = $2(l + b)$

Given $L = 2l$ & $B = 2b$

∴ New perimeter = $2[L + B] = 2\{2l + 2b\} = 2 \times 2(l + b)$

= 2 original perimeter

08. (D) Given

$$\frac{27 + x + 31 + x + 98 + x + 105 + x + 164 + x}{5} = 101$$

$$425 + 5x = 101 \times 5 = 505$$

$$5x = 505 - 425 = 80$$

$$x = \frac{80}{5} = 16$$

∴ Required mean

$$= \frac{(115 + x + 126 - x + 68 - 2x) + 73 + 4x + 56 + 5x}{5}$$

$$= \frac{438 + 7x}{5} = \frac{438 + 7 \times 16}{5} = \frac{438 + 112}{5}$$

$$= \frac{550}{5} = 110$$

09. (D) If a + b odd then one integer must be odd and other integer must be even

∴ $a^2 + b^2$ become odd

But given $a^2 + b^2$ must be even

∴ Option b i.e. a + b is odd is impossible

10. (B) Let number of correct sums be 'x'

$$\text{Given } 3x - 2(24 - x) = 37$$

$$3x - 48 + 2x = 37$$

$$5x = 85$$

$$x = 17$$

11. (C) No. of kilograms of fruits sold during the four hours = $35 + 26 + 45 + 20 = 126$

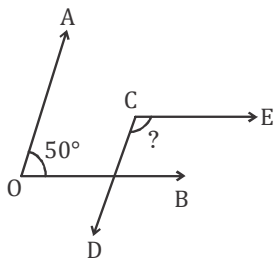
12. (D) $\angle CDB = \angle AOB = 50^\circ$

[Since corresponding angles]

$$\text{But } \angle C + \angle CDB = 180^\circ$$

$$\angle C + 50^\circ = 180^\circ$$

$$\angle C = 130^\circ$$



13. (C) $\text{LHS} = 7^{20} \times 7^{10} \times 7^{-30}$

$$= 7^{20 + 10 - 30} = 7^0 = 1$$

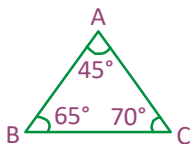
14. (C) Let the rational number to be multiplied be x

$$\frac{-39}{8} \times x = 26$$

$$x = 26 \times \frac{-8}{36} = \frac{-16}{3}$$

15. (A) In $\triangle ABC$, $45^\circ + 65^\circ + \angle C = 180^\circ$

$$\angle C = 180^\circ - 110^\circ = 70^\circ$$



$\therefore \angle A$ is smallest angle \Rightarrow BC is smallest side

$\angle C$ is greatest angle \Rightarrow AB is greatest side

16. (B) Distance covered in one revolution =

$$\frac{660}{500} \text{ m} = \frac{66}{50} \text{ m}$$

$$\therefore 2\pi r = \frac{66}{50} \text{ metres}$$

$$2 \times \frac{22}{7} \times r = \frac{66}{50} \text{ metres}$$

$$2r = \frac{66}{50} \times \frac{7}{22} \text{ metres}$$

$$= \frac{21}{50} \text{ metres} = \frac{21}{50} \times 100 \text{ cm} = 42 \text{ cm}$$

17. (A) Let the fraction be $\frac{5x}{8x}$

$$\text{Given } 8x + 5x = 91$$

$$13x = 91$$

$$x = \frac{91}{13} = 7$$

$$\therefore 8x - 5x = 3x = 3 \times 7 = 21$$

18. (C) $\frac{25^5}{12^1} \times \frac{28^4}{15^5} \times \frac{36^3}{35^1} \times \frac{5}{4^1} = 5$

19. (D) Given $3x - 9 : 5x - 9 = 12 : 23$

$$23(3x - 9) = 12(5x - 9)$$

$$69x - 207 = 60x - 108$$

$$69x - 60x = 207 - 108$$

$$9x = 99$$

$$x = 11$$

$$\therefore 5x = 5 \times 11 = 55$$

20. (D) Given $\left(\frac{1}{x}\right)^2 = \frac{1}{2.25} \times \frac{1}{6.25}$

$$x^2 = (1.5)^2 \times (2.5)^2$$

$$x^2 = (1.5 \times 2.5)^2$$

$$x^2 = (3.75)^2$$

$$x = 3.75$$

21. (D) Let the required number be 'x'

$$\text{Given } \frac{5(x+4) - 20}{8} = 12.5$$

$$5x = 100$$

$$x = \frac{100}{5} = 20$$

$$22. (C) \quad \frac{67.542 \times 67.542 - 32.458 \times 32.458}{75.458 - 40.374}$$

$$= \frac{4561.92176 - 1053.52176}{35.084}$$

$$= \frac{3508.4}{35.084} \times \frac{1000}{1000}$$

$$= \frac{3508400}{35084} = 100$$

$$23. (A) \quad \frac{-5}{7} \times \frac{14}{15} - \left(\frac{-5}{6} \right) = \frac{-2}{3} + \frac{5}{6} = \frac{-4+5}{6} = \frac{1}{6}$$

24. (C) Diagram paste from question paper

$$\text{Area} = 9\text{cm}^2 + 4(1\text{cm}) = 13\text{cm}^2$$

25. (B) Unshaded area = Rectangle area – shaded area

$$= 20 \times 10 \text{ cm}^2 - 2 \times 3.14 \times 5 \times 5$$

$$= 200 \text{ cm}^2 - 157 \text{ cm}^2$$

$$= 43 \text{ cm}^2$$

PHYSICS

26. (C) The sole of an electric iron needs to be hot during ironing. The material used must be able to conduct heat well.

27. (C) Car 1 has a higher speed and left one hour earlier than car 2. Therefore the distance travelled by car 1 will always be more than car 2 when they are both still moving at a constant speed. Thus, there is no meeting point between car 1 and car 2 under this condition. Even if they are given an equal time interval to move, car 1 would travel a farther distance as it has faster speed than car 2.

28. (D) The vapours of tea are at higher temperature than the surrounding air which is comparatively at lower temperature can cause the formation of convection currents above the tea.

29. (D) Light travels in straight lines. So, only in option (D) the holes are in line with the candle flame that can allow the light from the candle flame to reach the pupil's eye and enable him to see the candle flame.

30. (D) When the pendulum is set into motion from point P, it moves through Q and R. It does not remain at the extreme position R but comes back to Q and P. This movement of pendulum from P → Q → R and R → Q → P completes one oscillation.

31. (B) As the temperatures of iron ball and water are equal, there will be no flow of heat from iron ball to water or from water to iron ball.

32. (D) Batteries in the remote-controlled car have chemical energy that is converted to electrical energy in the electric circuit. The electrical energy is then converted to kinetic energy when the car moves, light energy when it lights up and sound energy when it makes sounds.

$$33. (B) \quad \text{Speed} = \frac{\text{Distance travelled}}{\text{Time}}$$

$$\text{Speed of runner(P)} = \frac{100}{13} = 7.69 \text{ m/s} \dots \text{III}$$

$$\text{Speed of runner(Q)} = \frac{100}{13.5} = 7.41 \text{ m/s} \dots \text{II}$$

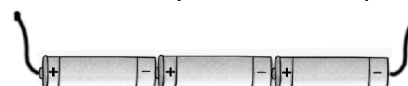
$$\text{Speed of runner(R)} = \frac{100}{14} = 7.14 \text{ m/s} \dots \text{I}$$

$$\text{Speed of runner(S)} = \frac{100}{12} = 8.33 \text{ m/s} \dots \text{IV}$$

The correct arrangement of increasing speeds of runners is R, Q, P, S.

34. (B) Black colour is a good absorber of heat. Hence, heat from the Sun is absorbed by the surface of the can to heat up water inside it.

35. (D) The correct arrangement of 3 cells to form a battery is shown in option (D).



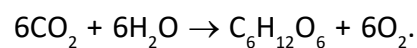
CHEMISTRY

36. (C) Conversion of animal waste into biogas by the action of anaerobic bacteria is a chemical change. Hence, process P is a chemical change. Process Q is also a chemical change as the obtained biogas undergoes several chemical processes to liquify and use it for cooking. Both the processes P and Q are chemical changes.
37. (C) Bases are usually oxides and hydroxides of metals (ex: CaO, Mg(OH)₂). Sodium chloride is a neutral salt formed by neutralisation of an acid with a base. All acids have hydrogen as a constituent.
38. (B) Carbon reacts with oxygen to form carbon dioxide, a new substance. It is a chemical change.
39. (C) $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$ is a neutralisation reaction.
40. (A) Breaking of an earthen pot, falling of trees during storm, rusting of bicycle parts and digestion of food are irreversible changes that cannot be reversed.
41. (D) pH is a measure of the concentration of hydrogen ions in a solution. The lower the pH, the higher the concentration of the hydrogen ions. Conversely, the higher the pH, the higher the concentration of hydroxide ions in the solution. So, solution of pH 12 has the highest concentration of hydroxide ions.
42. (B) $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$
(X)
- $2\text{MgO} + 2\text{H}_2\text{O} \rightarrow 2\text{Mg(OH)}_2$
(X) (Y)
43. (B) Lemon juice contains citric acid that turns blue litmus paper red.
44. (B) Statements I and III are correct. Iron and rust are chemically different and zinc coated iron pipes do not rust easily.
45. (D) Acids turn blue litmus to red while bases turn red litmus to blue.

BIOLOGY

46. (A) Given below is the equation of

photosynthesis:



Hence, X is CO₂.

47. (B) The pharynx is a tube-like structure that connects the nasal cavity and the back of the mouth to other structures lower in the throat, including the larynx. The pharynx has dual functions: to regulate both air and food. It allows swallowed substances to pass through it, so it is a part of both the respiratory and the digestive systems. So 'X' is Pharynx. The trachea, or windpipe, is the widest passage in the respiratory tract. The trachea branches at the bottom to form two bronchial tubes. So 'Y' is trachea.
48. (C) The given formula is used to calculate percolation rate of soil.
49. (A) The correct matching is :
1-(iii), 2-(ii), 3-(i), 4-(iv)
- | | | |
|-----------|---|-----------|
| Earthworm | - | Skin |
| Frog | - | Lungs |
| Fish | - | Gills |
| Cockroach | - | Spiracles |
50. (B) Arteries (X) are the blood vessels that carry blood containing oxygen from the heart to different parts of the body. Veins (Y) are blood vessels that carry blood rich in carbon dioxide from the body organs to the heart.
51. (D) Nutrients in living organisms are needed for the given activities.
52. (C) Amoeba ingests its food with the help of pseudopodia or even any part of the body. When amoeba senses any food in its surroundings, the food is engulfed by forming a vacuole and is digested with the help of digestive enzymes. The digested food is absorbed directly into the cytoplasm by the process of diffusion. Energy is obtained from the absorbed food that helps in its growth. The undigested food is egested out of the body of amoeba by rupturing the cell wall.
53. (B) A large muscular sheet that forms the floor of the chest cavity is called

Diaphragm.

54. (C) Maize, papaya and cucumber flowers contain either only stamen or only pistil, hence, they are unisexual flowers, Petunia, mustard and rose flowers contain both stamen and pistil, hence they are bisexual flowers.
55. (D) All the statements are correct. Capillaries are the smallest blood vessels that connect arteries to veins. They have thin walls through which oxygen, digested food, CO_2 , waste products etc., are exchanged between blood and the blood cells.

CRITICAL THINKING

56. (D) To ensure your digital safety, you shouldn't click on suspicious links or reply to such emails. Verifying with the source directly without engaging with the suspicious content is the safest approach
57. (A) When the load is closer to the fulcrum it is easier to move.

So, when figure 1 minimum force is required to lift the load of 5 kg, as it is closer to the fulcrum.



58. (D)
59. (C) DOCUMENT
60. (D)
- 1
↑
3 ← 6 ← 9
21 → 24 → 27
↑
63 ← 66