UNIFIED COUNCIL
Foundation for Success

UNIFIED COUNCIL OLYMPIADS

nstse
Test • Assess • Achieve

NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION

CLASS - 7

Question Paper Code : UN494

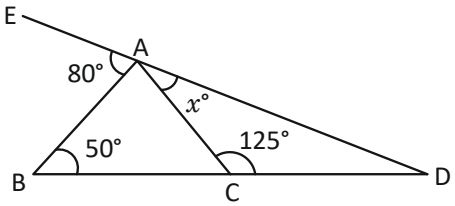
KEY

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

SOLUTIONS

MATHEMATICS

01. (C) We have, $\angle BCD = 180°$



So, $\angle ACB = 180° - 125° = 55°$

In ΔABC, $\angle BAC = 180 - (50 + 55) = 75°$

Since EAD is a straight line, we have,

$80 + 75 + x = 180°$

$\Rightarrow x = 25°$

02. (D) The greatest possible value of p^q is 3^4 i.e., 81

The greatest possible value of $p^q + r^s$ is $3^4 + 2^1$ i.e., 83

03. (B) $2^{\frac{1}{3}} \times 2^{\frac{1}{2}} \times 3^{\frac{1}{2}} \times 3^{\frac{1}{3}} = 2^{\frac{1}{3}+\frac{1}{2}} \times 3^{\frac{1}{3}+\frac{1}{2}}$

$= 2^{\frac{5}{6}} \times 3^{\frac{5}{6}}$

$= (2 \times 3)^{\frac{5}{6}}$

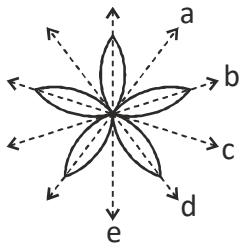
$= (6^5)^{\frac{1}{6}}$

04. (B) Given b = (h + 3) cm

Area of the triangle =

$$\frac{1}{2}bh=\frac{1}{2}h(h+3)\ cm^2$$

05. (B) The tips of the leaves form the vertices of a regular pentagon which has 5 lines of symmetry, as shown.



06. (B) $\angle ACB = 45°$

07. (C)
$$x=1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{\left(\frac{3}{2}\right)}}}$$

$$=1+\cfrac{1}{1+\cfrac{1}{1+\frac{2}{3}}}$$

$$=1+\cfrac{1}{1+\cfrac{1}{\left(\frac{5}{3}\right)}}$$

$$=1+\cfrac{1}{1+\frac{3}{5}}$$

$$=1+\cfrac{1}{\left(\frac{8}{5}\right)}$$

$$=1+\frac{5}{8}\ =\frac{13}{8}$$

$$\therefore\quad 2x+\frac{7}{4}=2\times\frac{13}{8}+\frac{7}{4}=\frac{20}{4}=5$$

08. (C)
$$\frac{19}{9}\times\frac{21}{19}\times\frac{3}{7}+\frac{3}{2}=x$$

$$1+\frac{3}{2}=x$$

$$\frac{5}{2}=x$$

09. (D) Perimeter = $2(l + b) = 2(5\ cm + 5\ cm)$

$= 2 \times 10\ cm = 20\ cm$

10. (D)
$$A=-1\frac{1}{4}$$

11. (A) LHS

$$=\left(\frac{12}{5}a^2bc-\frac{3}{5}abc+\frac{2}{3}a^2b\right)-\left(\frac{3}{2}a^2b+\frac{4}{5}b-\frac{1}{3}a^2bc\right)$$

$$=\frac{12}{5}a^2bc-\frac{3}{5}abc+\frac{2}{3}a^2b-\frac{3}{2}a^2b-\frac{4}{5}b+\frac{1}{3}a^2bc$$

$$=\frac{12}{5}a^2bc+\frac{1}{3}a^2bc-\frac{3}{5}abc+\frac{2}{3}a^2b-\frac{3}{2}a^2b-\frac{4}{5}b$$

$$=\frac{36a^2bc+5a^2bc}{15}-\frac{3abc}{5}+\left(\frac{4a^2b-9a^2b}{6}\right)-\frac{4b}{5}$$

$$=\frac{41a^2bc}{15}-\frac{3abc}{5}-\frac{5a^2b}{6}-\frac{4b}{5}$$

12. (B) 22

13. (C) Let breadth = x cm

Given, length = $4x$

According to the given problem we have,

$4x - 8 = x + 4$

$\Rightarrow 3x = 12$

$\Rightarrow x = 4$

$\therefore$ Length = $4x = 4 \times 4 = 16$ cm

Breadth = $x = 4$ cm

$\therefore$ Area = $l \times b = 16 \times 4 = 64\ cm^2$

14. (D) Let the length of pole be x cm

Given $\frac{5}{7}x - \frac{1}{3}x$ = 168 cm

$\frac{15x-7x}{21}$ = 168 cm

$8x$ = 168 cm × 21

x = 21 cm × 21 = 441 cm

15. (A) Given $\frac{\sum x}{5} = 27$

$\Rightarrow \sum x$ = 27 × 5 = 135 and also, when one value excluded the mean gets reduced by 2.

$\therefore \frac{\sum x}{4} = 27 - 2$

$\Rightarrow \frac{\sum x}{4} = 25 \Rightarrow \in x = 25 \times 4$

$\Rightarrow \sum x$ = 100

$\therefore$ Excluded value = 135 – 100 = 35

16. (A) $\frac{9^{-2} \times 18^{-4}}{3^{-16}} \times \left(\frac{9}{4}\right)^{-3} = \frac{3^{16}}{9^2 \times 18^4} \times \left(\frac{4}{9}\right)^3$

$= \frac{3^{16}}{3^4 \times 2^4 \times 3^8} \times \frac{4^3}{9^3} = \frac{3^{16-4-8}}{2^4} \times \frac{(2^6)}{(3^6)}$

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

17. (D) $\frac{0.5 \times 0.5 \times 0.5 - 0.7 \times 0.7 \times 0.7}{0.5 \times 0.5 + 0.5 \times 0.7 + 0.7 \times 0.7}$

$= \frac{0.125 - 0.343}{0.25 + 0.35 + 0.49}$

$= \frac{-0.218}{1.09} \times \frac{100}{100}$

$= \frac{-21.8}{109} = -0.2$

18. (A) Length = $4x$ & breadth = $3x$

$\therefore$ $12x^2$ = 1728

x^2 = 144

x = 12

$\therefore$ l = 48 mts & b = 36 mts

P = 2(l + b) = 168

Total cost of fencing = 168 m × ₹2.5

= ₹420

19. (D) $2x + 4x = 180°$

$x = 30°$

$30° + \angle BAD = 180°$

$\angle BAD = 150°$

20. (A) LHS

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

$+ \left(-x + \frac{3}{8}x\right) + \left(\frac{5}{3} + \frac{1}{5} - \frac{8}{15}\right)$

$= \frac{x^3}{4} - \frac{13x^2}{20} - \frac{5x}{8} + \frac{4}{3}$

21. (C) We make a chart of the pairs of positive integers which sum to 11.

1st (Z)	2nd (Z)	Product
1	10	10
2	9	18
3	8	24
4	7	28
5	6	30

So the greatest possible product is 30

22. (D) Given 2(12y + 7y) = 114 cm

38y = 114 cm

$y = \frac{114 \text{ cm}}{38} = 3$ cm

$\therefore$ CG = 12y – 3y = 9y = Q × 3 cm = 27 cm

CE = 7y – 2y = 5y = 5 × 3 cm = 15 cm

Area of the rectangle EFGC

= 27 × 15 cm^2 = 405 cm^2

Area of the shaded region

= Area of ABCD – Area of EFGC

= $(12y)\,(7y) - 405\ cm^2$

= $84y^2 - 405\ cm^2$

= $84 \times 9\ cm^2 - 405\ cm^2$

= $75\ cm^2 - 405\ cm^2 = 351\ cm^2$

23. (C) Other edge = $\dfrac{56\frac{1}{7}\,cm^2}{6cm}$

$= \dfrac{\cancel{393}^{131}}{7} \times \dfrac{1}{\cancel{6}_{2}}\,cm$

$= \dfrac{131}{14}\,cm$

$= 9\dfrac{5}{14}\,cm$

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

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

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

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

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

Ascending order is

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

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

$\therefore$ Descending order is

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

25. (D) Given $x + y + x + z + z + y = 3 + 2 + (-9) = -4$

$2x + 2y + 2z = -4$

$2(x + y + z) = -4$

$x + y + z = \dfrac{-4}{2} = -2$

PHYSICS

26. (D) Option (D) correctly represents the energy changes in electric iron, television and tubelight when electricity flows through them.

27. (D) Time taken by the sand to fall completely from the upper part to the lower part of the hourglass = 20 minutes. Time taken by a snail to eat a small leaf is the time taken for $\frac{3}{4}$ of the sand to fall to the bottom of the hourglass.

$= 20 \times \dfrac{3}{4} = 15$ minutes

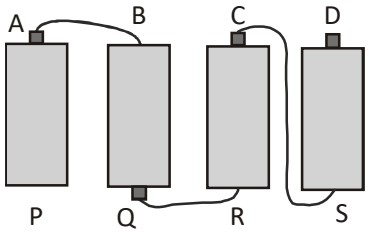
Time taken by the snail to eat a small leaf = 15 minutes.

28. (D) The outer surface should be black as more heat from the sun should be absorbed.

The inner surface should be coated with silver so that most of the heat is retained/radiated into the box.

29. (C) The correct connection of terminals with wires to make a battery of four cells is A-B, Q-R, C-S respectively.

The positive terminal of one cell is connected to the negative terminal of the next cell as shown below.



30. (B) 1 h = 3600 s

1 km = 1000 m

Student P's speed in m/s = 12000/3600

= 3.33 m/s

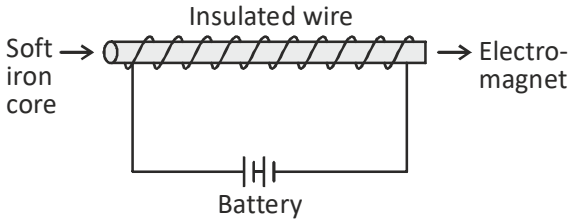
Student Q's speed in m/s = $\dfrac{4000}{3600}$

= 1.11 m/s.

Therefore, student Q runs faster than student P.

31. (C) The longer the distance that heat has to travel by conduction through the thick cotton cloth, lesser is the rate (speed) of heat transfer. So, to hold a hot cup of coffee or milk, it is better to use a thick cotton cloth.

32. (D) Electromagnets can be made more powerful than ordinary bar magnets. Soft iron is easy to magnetize when the current flows through the core and demagnetize when the flow of current is stopped. They are used in cranes and toys etc.



33. (B) Statements (A), (C) and (D) are not correct. As the student walks with the same speed to both the places, we can conclude that his father's field is nearer than the place where his tuition is held.

34. (C) As X and Y are in the thermal equilibrium, they have the same temperature.

Similarly, if Y and Z have the same temperature, then they are in thermal equilibrium (i.e., no net transfer of energy between Y and Z)

Hence, solids X, Y and Z are in thermal equilibrium and they have the same temperature.

35. (B) A 5 cm coil with 200 turns of insulated wire around the coil will make the strongest electromagnet for a given flow of current.

CHEMISTRY

36. (A) Reduced air pressure conditions cause the flow of wind to move from high pressure region to low pressure region.

37. (A) Sodium hydroxide in dilute form is a base and it reacts with dilute hydrochloric acid to form sodium chloride (salt) and water by undergoing neutralization reaction.

38. (C) While whipping of an egg white, air is forced into the egg white (a fluid) but no new substance is formed. Hence, it is a physical change.

39. (B) 10 grams of $NaCl$ is formed as given below

$$HCl + NaOH \rightarrow NaCl + H_2O$$
$$10\ g \quad 10\ g \quad 10\ g \quad 10\ g$$

40. (C) When a spoon of common salt is added to water, no new substance is formed. It is a physical change and physical changes are generally temporary (i.e. reversible). Salt dissolved and disappeared in water.

41. (B) An acid P and base R react to form a neutral solution of salt and water. A neutral solution has pH value of 7.

42. (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.

43. (A) Potassium hydroxide and nitric acid react to form potassium nitrate and water.

$$KOH + HNO_3 \rightarrow KNO_3 + H_2O$$

44. (B) Statements (A) (C) and (D) are incorrect.

Rust is hydrated iron oxide

$$4Fe + 3O_2 + 2H_2O \rightarrow 2Fe_2O_3.H_2O$$
Iron Oxygen Moisture Rust

45. (B) An aeroplane wing is flat at the bottom, curved on the top, rounded in the front and sloping to a sharp edge at the back. This shape is called an aerofoil or air foil.

While the plane is in motion, the wing travels through the air and the air must travel either over or under the wing. The air passing over the top of the wing has a greater distance to travel than the air passing under the wing in the same period of time. Therefore, air must flow faster over the wing than the air flowing under the wing. The pressure of the faster moving air on the top decreases. Higher air pressure on the underside of the wing pushes the wing upwards, giving 'lift' to the plane and causing the plane to stay up in the air.

BIOLOGY

46. (D) The given description is related to Sundew.

47. (D) Circulatory system helps in transportation of oxygen, CO_2 and nutrients.

48. (A) X is Glucose, Y is CO_2.

49. (C) In the given figure X, Y and Z denote pharynx, bronchi and trachea respectively.

50. (C) In the given figure 3 stores urine.

1 is Artery.

2 is Ureter – Carry urine to the bladder.

3 Urinary bladder – Store urine and

4 is Urethra – Urine released periodically.

51. (A) Cutting is the method employed as shown in figure.

52. (C) Oxygen is not necessary for photosynthesis.

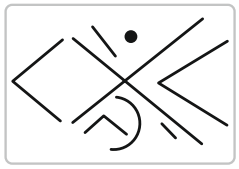
53. (A) Lichen undergoes special mode of nutrition called symbiosis. It is an example of a symbiotic relationship between an alga and a fungus. Both of them live together and are benefited mutually. Here, alga is an autotroph whereas fungus is a saprotroph. Fungus provides shelter with water and minerals to the algae from the soil. In return, the algae prepare food for the fungus by photosynthesis.

54. (C) During inspiration (X) the ribs are elevated, and during expiration (Y) the ribs are depressed.

55. (B) Cutaneous respiration is the only mode of respiration in Earthworm.

CRITICAL THINKING

56. (C) Imagine you have three toy trucks : X, Y and Z. X is the lightest, Y is a bit heavier and Z is the heaviest. If you push them all at the same speed into a wall, the heaviest truck (Z) would probably cause the most damage because it has more weight behind its push. So, Truck Z with 1500 kg would likely cause the most damage to the wall. Since it is the heaviest.

57. (A) 

58. (A) Below image shows the rules given by 1, 2, 3, 4, 5 and the below table shows the possible arrangement.

(I) 2 8 9 (II) 7 3 9 4

(III) 2 5 (IV) 7 6, 2 (IV) 1 5

7	3	1
2	8	5
6	9	4

59. (C)

60. (A) If Amit is at first place: since Aman cannot sit in third place, he will be either at 2nd or 4th place.

Now if Aman is at 2nd place, then Ankit and Aarav will be in 3rd or 4th place.

Now if Aman is at 4th place, then Ankit and Aarav will be in 2nd and 3rd place.

In both the above cases Ankit&Aarav will be made to sit together which is not allowed as per the conditions in the question. Hence it is clear that if Amit takes the first place then the given conditions are not followed. Hence the correct answer is option A.