



# UNIFIED COUNCIL

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## NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION (UPDATED)

CLASS - 7

Question Paper Code : UN446

### KEY

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

### SOLUTIONS

#### MATHEMATICS

1. (D)  $x^{\left(\frac{-p}{q}\right)^{-1}} = \left(\frac{1}{x}\right)^k$

$$x^{\left(\frac{-p}{q}\right)^{-1}} = x^{-k}$$

$$-k = \left(\frac{-p}{q}\right)^{-1}$$

$$-k = -\frac{q}{p}$$

$$k = \frac{q}{p}$$

2. (B) LHS =  $(-12) \times 6 - (-12) \times 4 \div (-2 \times -12)$

$$= (-12) \times 6 - \frac{(-12 \times 4)}{(-2 \times -12)}$$

$$= -72 - \frac{(-48)}{24}$$

$$= -72 + 2$$

$$= -70$$

3. (B) Let the middle strig length be  $x$  cm

Given  $\frac{x}{2} + x + 2x + 5 = 40$

$$\frac{x}{2} + 3x = 35$$

$$\frac{7x}{2} = 35$$

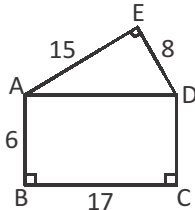
$$x = 10 \text{ cm}$$

$$\text{Longest piece} = 2x + 5 = 25 \text{ cm}$$

4. (B) Area of pentagon = Area of rectangle + Area of triangle

$$= (6 \times 17) + \frac{1}{2} \times 15 \times 8$$

$$= 102 + 60 = 162 \text{ units}^2$$



5. (A) Number of women =  $120 \times \frac{3}{5} = 72$

Number of married persons

$$= \frac{2}{3} \times 120 = 80$$

$$\text{Number of unmarried} = 120 - 80 = 40$$

This 40 may be women to become maximum women are unmarried

6. (C) 1 : 10 can not be the number of marbles ratio of the jar.

7. (C) exterior angle property of triangle

$$x = 35^\circ + 31^\circ = 66^\circ$$

$$\angle \text{AST} = 30^\circ + 36^\circ = 66^\circ = 66^\circ$$

$$\text{But } x + \angle \text{AST} + y = 180^\circ$$

$$66^\circ + 66^\circ + y = 180^\circ$$

$$y = 48^\circ$$

8. (Delete)

9. (Delete)

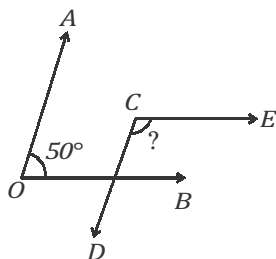
10. (D)  $\angle \text{CDB} = \angle \text{AOB} = 50^\circ$

[Since corresponding angles]

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

$$\angle \text{C} + 50^\circ = 180^\circ$$

$$\angle \text{C} = 130^\circ$$



11. (A)  $x + 2x + 3x + 4x = 360^\circ$

$$10x = 360^\circ$$

$$x = 36^\circ$$

$$\text{Greatest angle} = 4x = 4 \times 36^\circ = 144^\circ$$

12. (C) Division by zero is not undefined

13. (Delete)

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

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

15. (A)  $9^{4.5} : 3^7 = (3^2)^{4.5} : 3^7$

$$= 3^9 : 3^7 = 3^2 : 1 = 9 : 1$$

16. (B)  $P - Q + R = 3x - 4y - 8z - (-10y + 7x + 11z) + 19z - 6y + 4x$

$$= 3x - 4y - 8z + 10y - 7x - 11z + 19z - 6y + 4x$$

$$= \cancel{7x} - \cancel{7x} - \cancel{10y} + \cancel{10y} - \cancel{19z} + \cancel{19z}$$

$$= 0$$

17. (C) Let the number be 'x'

$$\text{Given } x + \frac{x}{5} = 30$$

$$\frac{6x}{5} = 30$$

$$x = 25$$

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

$$\therefore x \times \frac{x}{5} = 25 \times 5 = 125$$

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

$$2^2\left(\frac{4x+1}{6}\right) = 2^{-5}$$

$$\frac{4x+1}{3} = -5$$

$$4x + 1 = -15$$

$$4x = -16$$

$$x = -4$$

19. (C)  $(a-1)(a+1)(a^2+1)(a^4+1)(a^8+1)$

$$= (a^2-1)(a^2+1)(a^4+1)(a^8+1)$$

$$= (a^4-1)(a^4+1)(a^8+1)$$

$$= (a^8-1)(a^8+1)$$

$$= a^{16} - 1$$

20. (A) Value of house after 10 years

$$= ₹ 10,00,000 \times \frac{125}{100}$$

$$= ₹ 12,50,000$$

Value of house 10 years

$$= ₹ 12,50,000 \times \frac{75}{100}$$

$$= ₹ 9,37,500$$

21. (A) Required value =  $72 \times 0.845$  kg

$$= 60.84 \text{ kg}$$

22. (D) Centroid & incentre are always interior of a triangle

23. (C) CP of first book = ₹  $600 \times \frac{100}{120} = ₹ 500$

$$\text{CP of second book} = ₹ 600 \times \frac{100}{80}$$

$$= ₹ 750$$

$$\text{Total CP} = ₹ 500 + ₹ 750 = ₹ 1,250$$

$$\text{Total SP} = 2 \times ₹ 600 = ₹ 1,200$$

$$\text{Total loss} = ₹ 50$$

$$\text{Total loss percentage} = \frac{₹ 50}{₹ 1250} \times 100$$

$$= 4\%$$

24. (D) Let  $\angle ABD = \angle CAD = x$  &

$$\angle BAD = \angle ACD = y$$

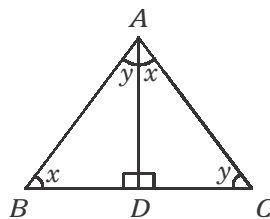
In  $\triangle ABD$

$$\angle B + \angle BAD + \angle D = 180^\circ$$

$$x + y + 90^\circ = 180^\circ$$

$$x + y = 90^\circ$$

$$\text{But } \angle BAC = x + y = 90^\circ$$



25. (D) Let the number be 'x'

$$\text{Given } \frac{x}{5} + 5 = \frac{x}{4} - 5$$

$$5 + 5 = \frac{x}{4} - \frac{x}{5}$$

$$10 = \frac{x}{20}$$

$$x = 200$$

### PHYSICS

26. (B) As object X is an electrical conductor, it allowed electric current to flow through it and the bulb lighted up.

27. (D) Mass remains constant when a metal rod is heated.

28. (D) 45 minutes =  $\frac{45}{60} = \frac{3}{4}$  h Distance covered = 18 km Time taken =  $\frac{3}{4}$  h

$$\therefore \text{Speed} = (18 \div \frac{3}{4}) \text{ km/h} \left( 18 \times \frac{4}{3} \right) \text{ km/h} = 24 \text{ km/h.}$$

29. (C) The iron nail will move towards electromagnet P as it has more coils of wire around it than electromagnet Q and thus, it exerts a stronger magnetic force than electromagnet Q.

30. (A) An example of contraction is riveting steel plates together.

**Option (B).** Skating on ice involves using pressure to melt ice.

**Option (C).** Sagging of telephones wires in an example of expansion.

**Option (D).** Drinking through a straw is possible because of atmospheric pressure.

31. (A) Speed of boy X is  $200 \text{ m} \div 20 \text{ s} = 10 \text{ m/s}$   
Speed of boy Y is  $200 \text{ m} \div 25 \text{ s} = 8 \text{ m/s}$

Thus, the speed of boy X is 10 m/s and that of boy Y is 8 m/s. So, boy X ran faster than boy Y. Both the boys ran the same distance, but one of them is faster than the other, because boy X covered more distance in a unit time than boy Y.

32. (D) Statements (A), (B) and (C) are correct. An electric circuit is a continuous, conducting path for flow of electric current.
33. (B) Heat will flow from a region of higher temperature to a region of lower temperature until equilibrium of temperature is reached i.e., 25° C.
34. (D) As the length of a pendulum is longer, its period will also increase.

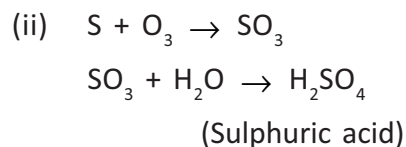
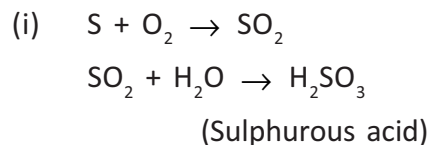
$$T = 2\pi\sqrt{\frac{l}{g}}$$

35. (C) The strength of an electromagnet depends on the number of turns of wire on a coil and flow of current through it. Among the given options, the coil with 20 turns of wire and 0.5 A flow of current through it makes it the strongest electromagnet.

### CHEMISTRY

36. (D) Iron, when mixed with sulphur in the right proportion and heated forms a new substance, i.e., iron sulphide, a black residue. Iron sulphide is not attracted to a magnet. Both iron and sulphur in the iron sulphide cannot be seen and identified. Iron sulphide being a black residue is not attracted to a magnet.
37. (B) Calcium hydroxide (slaked lime) is used to reduce the acidity in soil.
38. (A) Areas along the shores will be mostly affected by a strong typhoon.
39. (D) An exothermic process releases net heat energy when water vapour molecules come together to form liquid droplets as weak intermolecular attractive forces are formed amongst them.
40. (A) X being cold winds which are heavy move towards places of low pressure and show lateral/sideways movement. Warm winds Y being lighter, rise up and show vertical movement.
41. (D) Calcium, Copper and Magnesium burn in oxygen to form metallic oxides that are basic in nature. Sulphur being a non-metal burns in oxygen to form an acidic oxide, sulphur dioxide. In excess of

oxygen, it forms sulphur trioxide. When these oxides dissolve in water, they form sulphurous and sulphuric acid respectively as given below with a pH of less than 7.



42. (C) A chemical change always involves the formation of a new chemical substance.

**Option (A) :** Chemical changes are not reversible.

**Option (B) :** Chemical changes involve energy changes.

**Option (D) :** Heat and light are often given off during chemical changes.

43. (A) As acids contain ions which have been formed by dissociation of the acid molecules in water, they are electrolytes. So, they conduct electricity.

44. (B) The correct combination is  
a-4, b-3, c-2, d-1

Burning of wood – chemical change

Formation of days and nights – periodic change.

Curdling of milk – slow change

Melting of ice – physical change

45. (A) Sodium hydroxide and hydrochloric acid react to form sodium chloride and water which is a neutralisation reaction.

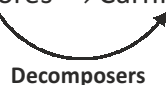
**Option (B) :** It is thermal decomposition of calcium carbonate.

**Option (C) :** It is burning (combustion) of hydrogen gas.

**Option (D) :** It is burning (combustion) of methane gas.

## BIOLOGY

46. (B) Rain forest have a shallow layer of fertile soil so trees need only shallow roots to reach the nutrient. Plants in rain forest grow roots close to the ground to survive.
47. (B) In the given food chain frog and snake are both a prey and a predator. The prey of frog is fruitfly and snake is its predator and the prey of snake is the frog and its predator is the eagle.
48. (D) Decomposers helps to reduce dead organic matter to minerals or as nutrients to the soil.
49. (C) Given flow chart shows the process of formation of fruit from flower. Flowers develop into fruit after pollination and fertilization.
- Pollination takes place before fertilization
50. (A) Trachea → bronchus → bronchiole → alveoli
51. (B) Byproducts of aerobic respiration are carbon dioxide and water and in anaerobic respiration are lactic acid, and it needs to be oxidised to carbon dioxide and water.
52. (B) Grass the roots of plants on hill slopes can slow down the flow of rain water.
- The roots of grass and plants bind the soil together and thus prevent the soil from being washed down by rain water or blown away by wind. Hence, the grass growing on hill slopes prevents soil erosion.
53. (A) Gas H is oxygen gas. It is produced when plants make food during photosynthesis. It is used when living things including plants carry out respiration.
- [In sunlight, plants carry out both photosynthesis and respiration, plants produce a lot of oxygen in photosynthesis but they use only part of it for respiration. The remaining oxygen is given out be plants through tiny openings called stomata found mainly on their leaves.]
54. (D) Transfer of energy flow is
- Producers → Herbivores → Carnivores



55. (C) Penguins have a thick layer of feathers to trap air to reduce heat loss from their bodies to the cold surroundings. Air is a poor conductor of heat.

Penguins have a layer of fat or blubber beneath their skin to keep them warm when swimming in water.

Penguins huddle together without moving for days when the temperature is very low. This behavioural adaptation helps the birds to keep warm and also conserves energy as they do not need to move about to keep warm.

### CRITICAL THINKING

56. (C) The table below shows the number of tries to each padlock in the worst-case scenario.

A	B	C	D	E	F	G	H	I
8	7	6	5	4	3	2	1	0

$$0 + 1 + 2 + \dots + 6 + 7 + 8 = 36$$

I must try 36 times at the most.

57. (D) digit '5' in the ones place :  
5, 15, 25, ... , 255 = 26 times

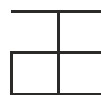
digit '5' in the tens place :  
50, 51, 52, ... , 255 = 26 times

digit '5' in the hundreds place : 0

$$26 + 26 = 52$$

The digit '5' appears 52 times in a book that has 255 pages.

58. (A)



The symbols are mirror images of 5, 4, 3, 2 in the first row and 9, 8, 7 in the second row. Hence the next one is 6.

59. (D)

60. (B) Boxing, Tennis doubles, Basket ball, Hockey